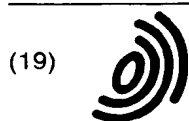


F4



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 310 494 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 158(3) EPC

(43) Date of publication:
14.05.2003 Bulletin 2003/20

(21) Application number: **01955606.7**

(22) Date of filing: **09.08.2001**

(51) Int Cl.⁷: **C07D 263/32**, C07D 277/24,
C07D 413/04, C07D 263/48,
C07D 263/34, C07D 277/28,
C07D 417/04, C07D 233/64,
C07D 233/70, C07D 233/88,
C07D 233/90, A61K 31/421,
A61K 31/4439, A61K 31/426,
A61K 31/4164, A61K 31/4709,
A61K 31/506, A61K 31/422,
A61K 31/427
// (A61P43/00, 3:10, 3:06, 3:04,
9:10, 9:00)

(86) International application number:
PCT/JP01/06836

(87) International publication number:
WO 02/014291 (21.02.2002 Gazette 2002/08)

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **11.08.2000 JP 2000243596**
28.12.2000 JP 2000402893

(71) Applicant: **NIPPON CHEMIPHAR CO., LTD.**
Tokyo 101-8678 (JP)

(72) Inventors:
• **SAKUMA, Shogo**
Yoshikawa-shi, Saitama 342-0055 (JP)
• **ENDO, Tsuyoshi**
Itabashi-ku, Tokyo 174-0065 (JP)
• **TENDO, Atsushi**
Kasukabe-shi, Saitama 344-0005 (JP)

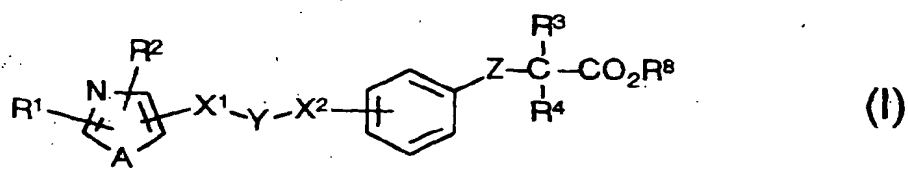
- **TAKAHASHI, Toshihiro**
Misato-shi, Saitama 341-0033 (JP)
- **YOSHIDA, Shinichi**
Funabashi-shi, Chiba 273-0031 (JP)
- **KOBAYASHI, Kunio**
Misato-shi, Saitama 341-0018 (JP)
- **MOCHIZUKI, Nobutaka**
Abiko-shi, Chiba 270-1166 (JP)
- **YAMAKAWA, Tomio**
Kashiwa-shi, Chiba 277-0884 (JP)
- **KANDA, Takashi**
Misato-shi, Saitama 341-0003 (JP)
- **MASUI, Seiichiro**
Ageo-shi, Saitama 362-0072 (JP)

(74) Representative: **Albrecht, Thomas, Dr. et al**
Kraus & Weisert,
Thomas-Wimmer-Ring 15
80539 München (DE)

(54) **PPAR (delta) ACTIVATORS**

(57) Compounds of the general formula (I) or salts thereof and activators of PPAR δ (peroxisome proliferator activated receptor δ) containing the compounds or the salts as the active ingredient: wherein R¹ and R² each are hydrogen, C₁₋₈ alkyl, an aryl or heterocyclic group which may be substituted, or the like; A is oxygen, sulfur, or the like; X¹ and X² are each a free valency, oxygen, S(O)_p (wherein p is an integer of 0 to 2), C(=O), C(=O)NH, NHC(=O), CH=CH, or the like; Y is optionally substituted C₁₋₈ alkylene; Z is oxygen or sulfur; R³ and R⁴ are each optionally substituted C₁₋₈ alkyl; and R⁸ is hydrogen or C₁₋₈ alkyl, with the proviso that when X¹ is a free valency, X² is not O or S(O)_p, while when X¹ is C(=O)NH, X² is not a free valency.

EP 1 310 494 A1



Description

[FIELD OF THE INVENTION]

[0001] The present invention relates to an activator of peroxisome proliferator activated receptor δ .

[BACKGROUND OF THE INVENTION]

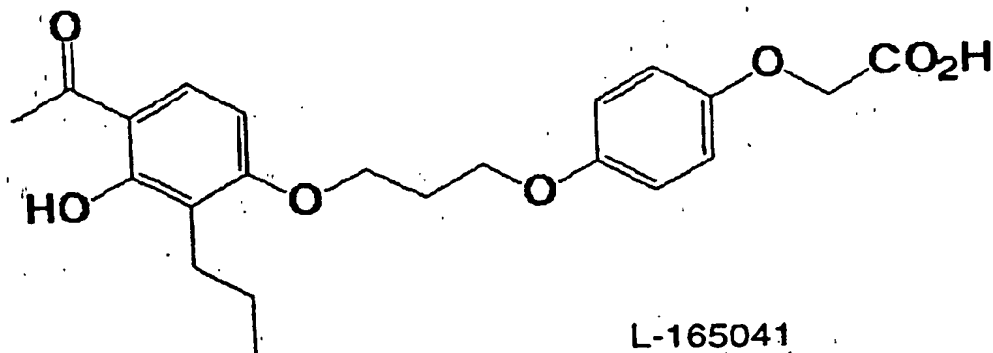
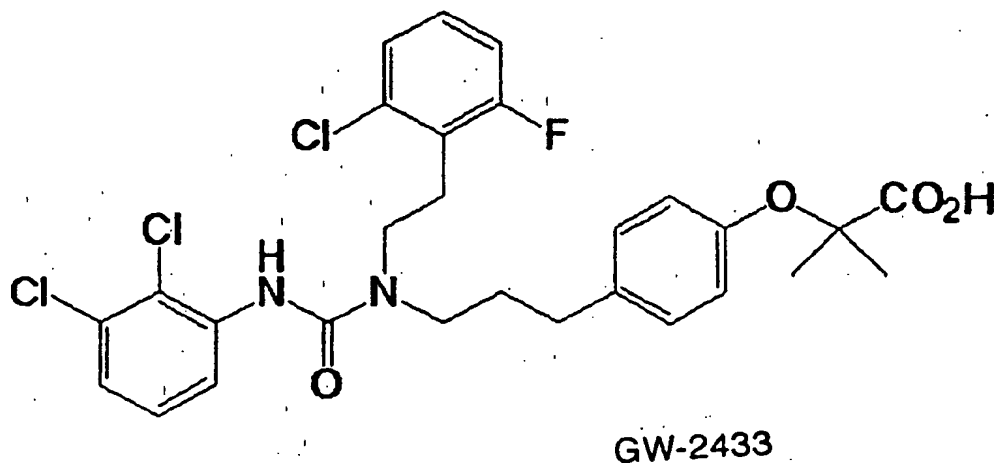
[0002] The peroxisome is a small organ present in cells of animals and plants, and its matrix contains various enzymes such as catalase. The peroxisome proliferator is a substance inducing proliferation of the peroxisome. Various compounds such as fibrates, herbicides, and phthalic acid plasticizers are known to be able to induce proliferation of peroxisome.

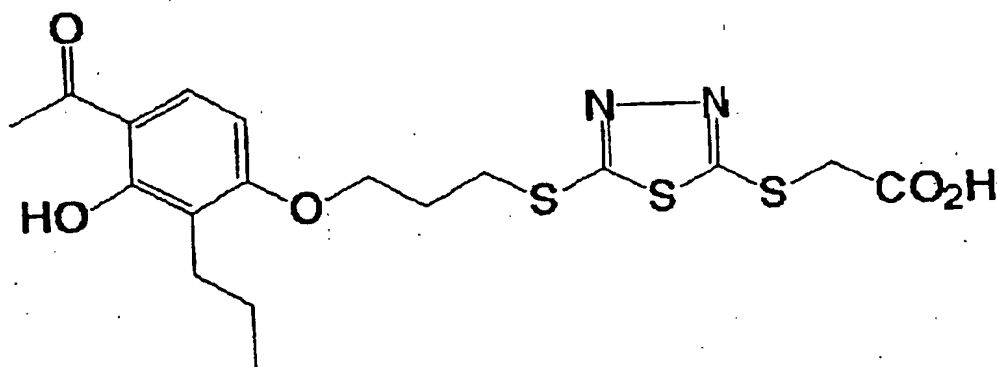
[0003] Isseman, et al. have identified a nuclear receptor which is activated by the peroxisome proliferator and given a name of peroxisome proliferator activated receptor (PPAR). --- Nature, 347, p645-650, 1990.

[0004] As PPAR, three subtypes such as PPAR α , PPAR γ and PPAR δ have been identified until now. --- Proc. Natl. Acad. Sci. USA, 91, p7335-7359, 1994.

[0005] The above-mentioned fibrates are a class of TG (triglyceride) lowering drugs that mediate their clinical effects through activation. Further, thiazolidine compounds (Troglitazone, Rosiglitazone, Pioglitazone) useful in the treatment of diabetes are also known as ligands of PPAR γ .

[0006] As a pharmaceutical having PPAR δ activating effect, there are known GW-2433 (Glaxo Wellcome), L-165041 (Merck), and YM-16638 (Yamanouchi Pharmaceutical each having the following formula:





YM-16638

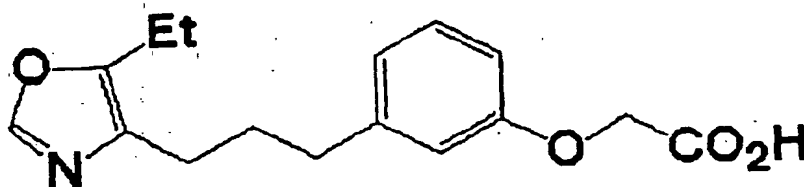
[0007] WO 92/10468 describes that GW-2433 can be employable for prevention and treatment of atherosclerosis.

[0008] WO 97/28115 describes that L-165041 can be employable for treatment of diabetes and suppression of obesity.

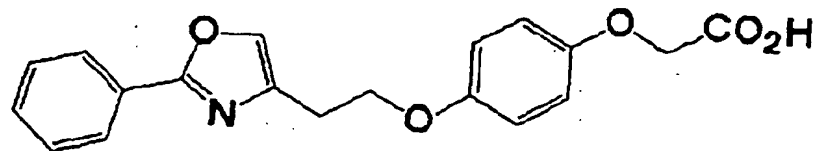
[0009] WO 99/04815 describes that YM-16638 shows effects for reducing serum cholesterol and reducing LDL cholesterol.

[0010] Recently, JBC, 272(6), p3406-3410, 1997 and Cell, 99, p335-345, 1999 describe proposal for application of PPAR δ ligand as an anti-cancer agent and an anti-inflammatory agent.

[0011] European Patent 558 062 describes the following compound A which has a structure similar to that of the general formula (II) [mentioned below] representing an oxazole derivative of the invention:



[0012] J. Immunol. Methods, 207(1), 23-31, 1997 describes a compound B having the following formula:



[0013] All of the oxazole derivatives identified by the compound A, compound B and the general formula (II) of the invention may be described as compounds of phenoxyacetic acid type. However, there are clear structural difference between the compounds A, B and the compound of the invention, that is, the compounds A, B have no substituents at the α -site, while the compound of the invention is a compound of α,α -dialkylphenoxy type.

[0014] In addition, while the above-mentioned EP 558 062 teaches that the compound A is of value for treatment of hyperthrombinemia and as blood pressure depressant, no mention is given with respect to an effect as PPAR δ ligand. Further, while the J. Immunol. Methods teaches the use of the compound B as blood pressure depressant, there is no concrete description to teach that the compound is effective as PPAR δ ligand.

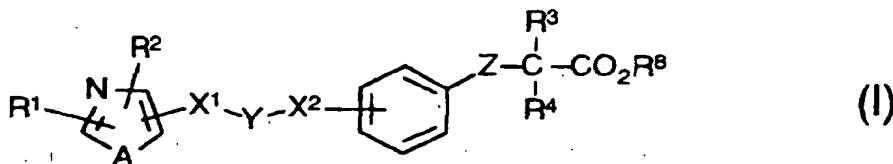
[0015] Recently, WO 01/40207 describes a substituted oxa(thia)zole derivative showing an agonist action for PPAR α , and WO 01/16120 describes an oxa(thia)zole derivative substituted with a biaryl group which is employable as a PPAR controlling agent.

[0016] In comparison with the compounds of the invention, the compound of WO 01/40207 has C(=O)NH as X¹ and a bond as X₂, and the compound of WO 01/16120 has a bond as X¹ and O, X or the like as X₂. Accordingly, the structural difference is clear.

[0017] The present invention provides a compound having the below-mentioned general formula (I), an oxazole derivative having the below-mentioned general formula (II), and a thiazole derivative having the below-mentioned general formula (III), all of which has an action as activator of peroxisome proliferator activated receptor δ .

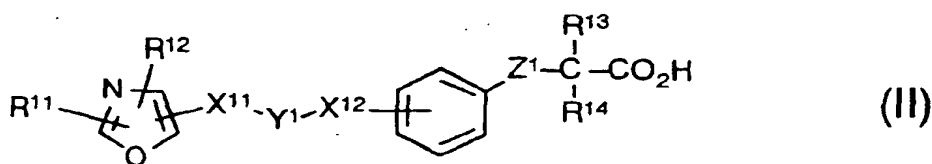
[DISCLOSURE OF THE INVENTION]

[0018] The invention resides in a compound having the following general formula (I) or a salt thereof:



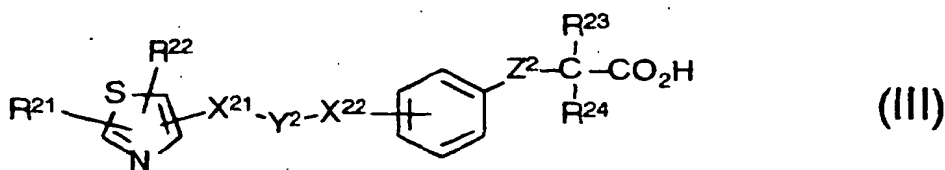
[wherein each of R¹ and R² independently is a hydrogen atom, an alkyl group having 1-8 carbon atoms, an alkyl group having 1-8 carbon atoms and a halogen atom substituent, an alkenyl group having 2-8 carbon atoms, an alkynyl group having 2-8 carbon atoms, a 3-7 membered cycloalkyl group, an alkyl group having 1-8 carbon atom and a 3-7 membered substituent, an arylalkyl group that has a C₆₋₁₀ aryl portion and C₁₋₄ alkyl portion and optionally has a substituent, or an aryl or heterocyclic group which optionally has a substituent; A is O, S, or NR⁵ in which R⁵ is H or C₁₋₈ alkyl; each of X¹ and X₂ independently is a bond (free valency), O, S(O)_p in which p is an integer of 0 to 2, C(=O), C(-N-OR⁶) in which R⁶ is H or C₁₋₈ alkyl; C(=O)NH, NHC(=O), SO₂NH, NHSO₂, CH(OR⁷) in which R⁷ is H or C₁₋₈ alkyl, CH=CH, or C≡C; Y is an alkylene chain having 1-8 carbon atoms and optionally a substituent; Z is O or S; each of R³ and R⁴ independently is an alkyl group having 1-8 carbon atoms and optionally a substituent; and R⁶ is a hydrogen atom or an alkyl group having 1-8 carbon atoms; provided that X₂ is neither O nor S(O)_p when X¹ is a bond, while X₂ is not a bond when X¹ is C(=O)NH].

[0019] Further, the invention provides an oxazole derivative having the following formula (II) or a salt thereof:



[wherein each of R¹¹ and R¹² independently is an alkyl group having 1-8 carbon atoms, an alkyl group having 1-8 carbon atoms and 1-3 halogen atom substituents, an alkenyl group having 2-8 carbon atoms, an alkynyl group having 2-8 carbon atoms, a 3-7 membered cycloalkyl group, an alkyl group having 1-8 carbon atom and a 3-7 membered substituent, or a phenylalkyl group having C₁₋₄ alkyl portion, phenyl group, naphthyl group, pyridyl group, thienyl group, furyl group, quinolyl group, benzofuranyl group or benzothienyl group which optionally contains a substituent of halogen, hydroxyl, nitro, amino, C₁₋₈ alkyl, C₁₋₈ alkyl having 1-3 halogen substituents, C₁₋₈ alkoxy, C₁₋₈ alkoxy having 1-3 halogen substituents, phenyl, benzyl, phenyloxy, benzoyl or pyridyl; each of X¹¹ and X¹² independently is a bond, S(O)_q in which q is an integer of 0 to 2, C(=O), C(=N-OR¹⁶) in which R¹⁶ is H or C₁₋₈ alkyl; C(=O)NH, NHC(=O), SO₂NH, NHSO₂, CH(OR¹⁷) in which R¹⁷ is H or C₁₋₈ alkyl, CH=CH, or C≡C; Y₁ is an alkylene chain having 1-8 carbon atoms and optionally a C₁₋₈ alkyl or C₁₋₈ alkoxy substituent; Z₁ is O or S; each of R¹³ and R¹⁴ independently is an alkyl group having 1-8 carbon atoms and optionally a halogen or C₁₋₈ alkoxy substituent; provided that X¹² is neither O nor S(O)_q when X¹¹ is a bond, while X¹² is not a bond when X¹¹ is C(=O)NH].

[0020] Furthermore, the invention provides a thiazole derivative having the following formula (III) or a salt thereof:



10 [wherein each of R²¹ and R²² independently is an alkyl group having 1-8 carbon atoms, an alkyl group having 1-8 carbon atoms and 1-3 halogen atom substituents, an alkenyl group having 2-8 carbon atoms, an alkynyl group having 2-8 carbon atoms, a 3-7 membered cycloalkyl group, an alkyl group having 1-8 carbon atom and a 3-7 membered substituent, or a phenylalkyl group having C₁₋₄ alkyl portion, phenyl group, naphthyl group, pyridyl group, thienyl group, furyl group, quinolyl group, benzofuranyl group or benzothienyl group which optionally contains a substituent of halogen, hydroxyl, nitro, amino, C₁₋₈ alkyl, C₁₋₈ alkyl having 1-3 halogen substituents, C₁₋₈ alkoxy, C₁₋₈ alkoxy having 1-3 halogen substituents, phenyl, benzyl, phenyloxy, benzoyl or pyridyl; each of X²¹ and X²² independently is a bond, S(O)_r in which r is an integer of 0 to 2, C(=O), C(=N-OR²⁶) in which R²⁶ is H or C₁₋₈ alkyl; C(=O)NH, NHC(=O), SO₂NH, NHSO₂, CH (OR²⁷) in which R²⁷ is H or C₁₋₈ alkyl, CH=CH, or C=C; Y² is an alkylene chain having 1-8 carbon atoms and optionally a C₁₋₈ alkyl or C₁₋₈ alkoxy substituent; Z² is O or S; each of R²³ and R²⁴ independently is an alkyl group having 1-8 carbon atoms and optionally a halogen or C₁₋₈ alkoxy substituent; provided that X²² is neither O nor S(O)_r when X²¹ is a bond, while X²² is not a bond when X²¹ is C(=O)NH].

20 **[0021]** Furthermore, the invention provides an activator of peroxisome proliferator activated receptor δ which contains as an effective component a compound of the formula (I), an oxazole derivative of the formula (II), or a thiazole derivative of the formula (III) or their salts.

25 **[PREFERRED EMBODIMENTS OF THE INVENTION]**

[0022] The present invention is described below in more detail.

[0023] The meanings of the symbols in the formula (I) are described below.

30 **[0024]** In the formula (I), examples of the alkyl groups having 1-8 carbon atoms for R¹, R², R⁵, R⁶, R⁷ and R⁸ include methyl, ethyl, propyl, isopropyl, butyl, isobutyl, t-butyl and pentyl.

[0025] Examples of the alkyl groups having 1-8 carbon atoms and a halogen substituent for R¹ and R² include methyl, ethyl, propyl, isopropyl, butyl, and t-butyl which are substituted with 1-3 halogens such as fluorine, chlorine, and bromine. Preferred are trifluoromethyl, chloromethyl, 2-chloroethyl, 2-bromoethyl and 2-fluoroethyl.

[0026] Examples of the alkenyl groups having 2-8 carbon atoms for R¹ and R² include vinyl and allyl.

35 **[0027]** Examples of the alkynyl groups having 2-8 carbon atoms for R¹ and R² include propargyl.

[0028] Examples of the 3-7 membered cycloalkyl group for R¹ and R² include cyclohexyl and cyclopentyl.

[0029] Examples of the alkyl groups having 1-8 carbon atoms and a 3-7 membered cycloalkyl substituent for R¹ and R² include cyclohexylmethyl and cyclopentylmethyl.

40 **[0030]** Examples of the arylalkyl groups (having C₆₋₁₀ aryl portion and C₁₋₄ alkyl portion) which optionally contain a substituent for R¹ and R² include alkyl groups having 1-4 carbon atoms substituted with a phenyl or naphthyl group which can have a substituent selected from the group consisting of halogens (e.g., fluorine, chlorine, bromine), hydroxyl, nitro, amino, C₁₋₈ alkyl groups (e.g., methyl, ethyl, propyl, isopropyl, butyl, isobutyl, t-butyl), C₁₋₈ alkyl groups substituted with 1-3 halogen atoms (e.g., trifluoromethyl, trifluoroethyl), C₁₋₈ alkoxy groups (e.g., methoxy, ethoxy), C₁₋₈ alkyl groups substituted with 1-3 halogen atoms (e.g., 2-chloroethoxy), phenyl, benzyl, phenyloxy, benzoyl, and pyridyl. Preferred are methyl or ethyl group substituted with phenyl which can have a substituent of C₁₋₆ alkyl (e.g., methyl, ethyl, propyl), C₁₋₆ alkoxy (methoxy, ethoxy), or halogen (fluorine, chlorine, bromine). More preferred are benzyl, benzhydryl, and phenethyl.

45 **[0031]** Examples of the aryl groups optionally having a substituent for R¹ and R² include a phenyl or naphthyl group which can have a substituent selected from the group consisting of halogens (fluorine, chlorine, bromine), hydroxyl, nitro, amino, substituted amino (dimethylamino), C₁₋₈ alkyl groups (methyl, ethyl, propyl, isopropyl, butyl, isobutyl, t-butyl), C₁₋₈ alkyl groups substituted with 1-3 halogen atoms (trifluoromethyl, trifluoroethyl), C₁₋₈ alkoxy groups (methoxy, ethoxy), C₁₋₈ alkyl groups substituted with 1-3 halogen atoms (e.g., 2-chloroethoxy), acyl (acetyl, benzoyl), carboxyl, phenyl, benzyl, phenyloxy or pyridyl. Preferred are phenyl, 2-chlorophenyl, 3-chlorophenyl, 4-chlorophenyl, 2,3-dichlorophenyl, 2,4-dichlorophenyl, 2,6-dichlorophenyl, 2-fluorophenyl, 2-trifluoromethylphenyl, 4-chloro-2-hydroxyphenyl, 2-methylphenyl, 4-butylphenyl and naphthyl.

55 **[0032]** Examples of the heterocyclic groups optionally having a substituent for R¹ and R² include 5-8 membered heterocyclic groups having 1-3 ring-forming hetero atoms selected from the group of nitrogen atom, oxygen atom and sulfur atom and remaining carbon atoms, such as pyridyl, thienyl furyl, and thiazolyl, and further include condensed

ring groups formed of these heterocyclic ring and benzene ring, such as quinolyl, benzofuranyl and benzothienyl. These heterocyclic groups can have a substituent such as that described for the aryl group having a substituent for R¹ and R².

[0033] Y is an alkylene chain which has 1-8 carbon atoms and may be substituted with C₁₋₈ alkyl (e.g., methyl, ethyl, propyl) or C₁₋₈ alkoxy (methoxy, ethoxy). Preferred are alkylene chains having 1-6 carbon atoms. More preferred are methylene, ethylene, and propylene.

[0034] Examples of the alkyl groups having 1-8 carbon atoms and optionally containing a substituent for R³ and R⁴ include alkyl groups having 1-8 carbon atoms which may have a halogen atom (e.g., fluorine, chlorine, bromine) or C₁₋₈ alkoxy (e.g., methoxy, ethoxy). Preferred are methyl, ethyl, and propyl.

[0035] The meanings of the symbols in the formula (II) are described below.

[0036] In the formula (II), examples of the alkyl groups having 1-8 carbon atoms for R¹¹, R¹², R¹⁵, R¹⁶ and R¹⁷ include methyl, ethyl, propyl, isopropyl, butyl, isobutyl, t-butyl and pentyl.

[0037] Examples of the alkyl groups having 1-8 carbon atoms and a halogen substituent for R¹ and R² include methyl, ethyl, propyl, isopropyl, butyl, and t-butyl which are substituted with 1-3 halogens such as fluorine, chlorine, and bromine. Preferred are trifluoromethyl, chloromethyl, 2-chloroethyl, 2-bromoethyl and 2-fluoroethyl.

[0038] Examples of the alkenyl groups having 2-8 carbon atoms for R¹¹ and R¹² include vinyl and allyl.

[0039] Examples of the alkynyl groups having 2-8 carbon atoms for R¹¹ and R¹² include propargyl.

[0040] Examples of the 3-7 membered cycloalkyl group for R¹¹ and R¹² include cyclohexyl and cyclopentyl.

[0041] Examples of the alkyl groups having 1-8 carbon atoms and a 3-7 membered cycloalkyl substituent for R¹¹ and R¹² include cyclohexylmethyl and cyclopentylmethyl.

[0042] Examples of the phenylalkyl (having C₁₋₄ alkyl portion), phenyl, naphthyl, pyridyl, thienyl, furyl, quinolyl, benzofuranyl and benzothienyl groups for R¹¹ and R¹² may contain a substituent of halogen (e.g., fluorine, chlorine, bromine), hydroxyl, nitro, amino, C₁₋₈ alkyl (e.g., methyl, ethyl, propyl), C₁₋₈ alkyl substituted with 1-3 halogen atoms (e.g., trifluoromethyl, trifluoroethyl), C₁₋₈ alkoxy (e.g., methoxy, ethoxy), C₁₋₈ alkoxy substituted with 1-3 halogen atoms (e.g., chloroethoxy), phenyl, benzyl, phenyloxy, benzoyl, or pyridyl. The phenylalkyl group (having 1-4 carbon atoms) can be benzyl, benzhydryl and phenethyl.

[0043] Y¹ is an alkylene chain which has 1-8 carbon atoms and may be substituted with C₁₋₈ alkyl (e.g., methyl, ethyl, propyl) or C₁₋₈ alkoxy (methoxy, ethoxy). Preferred are alkylene chains having 1-6 carbon atoms. More preferred are methylene, ethylene, and propylene.

[0044] Examples of the alkyl groups having 1-8 carbon atoms and optionally containing a substituent for R¹³ and R¹⁴ include alkyl groups having 1-8 carbon atoms which may have a halogen atom (e.g., fluorine, chlorine, bromine) or C₁₋₈ alkoxy (e.g., methoxy, ethoxy). Preferred are methyl, ethyl, and propyl.

[0045] The meanings of the symbols in the formula (III) are described below.

[0046] R²¹, R²², R²⁵, R²⁶, R²⁷ and Y² of the formula (III) are those described for R¹¹, R¹², R¹⁵, R¹⁶, R¹⁷ and Y¹ of the formula (II).

(1) A preferred compound of the invention is an oxazole derivative of the formula (II) in which X¹¹ is a bond, and its salt.

(2) Another preferred compound of the invention is an oxazole derivative of the formula (II) or of (1) above in which X¹² is a bond, C(=O), C(=N-OH), C(=O)NH, NHC(=O), CH(OH) or CH=CH, and its salt.

(3) A further preferred compound of the invention is an oxazole derivative of the formula (II) or of (1) or (2) in which R¹¹ is a phenyl group, naphthyl group, pyridyl group, thienyl group, furyl group, quinolyl group, benzofuranyl group or benzothienyl group which optionally contains a substituent of halogen, hydroxyl, nitro, amino, C₁₋₈ alkyl, C₁₋₈ alkyl having 1-3 halogen substituents, C₁₋₈ alkoxy, C₁₋₈ alkoxy having 1-3 halogen substituents, phenyl, benzyl, phenyloxy, benzoyl or pyridyl, and its salt.

(4) A still further preferred compound of the invention is an oxazole derivative of the formula (II) or of (1) or (2) in which R¹¹ is phenyl, 2-chlorophenyl, 3-chlorophenyl, 4-chlorophenyl, 2,3-dichlorophenyl, 2,4-dichlorophenyl, 2,6-dichlorophenyl, 2-fluorophenyl, 2-trifluoromethylphenyl, 4-chloro-2-hydroxyphenyl, 2-methylphenyl, 4-butylphenyl or naphthyl, and its salt.

(5) A still further preferred compound of the invention is an oxazole derivative of the formula (II) or of (1)-(4) above in which R¹² is an alkyl group having 1-8 carbon atoms, or an alkyl group having 1-8 carbon atoms and 1-3 halogen atom substituents, and its salt.

(6) A still further preferred compound of the invention is an oxazole derivative of the formula (II) or of (1)-(5) above in which R¹² is attached to the 2-position of the oxazole ring, and its salt.

(7) A still further preferred compound of the invention is a thiazole derivative of the formula (III) in which X²¹ is a bond, and its salt.

(8) A still further preferred compound of the invention is a thiazole derivative of the formula (III) or of (7) above in which X²² is a bond, C(=O), C(=N-OH), C(=O)NH, NHC(=O), CH(OH) or CH=CH, and its salt.

(9) A still further preferred compound of the invention is a thiazole derivative of the formula (III) or of (7) or (8) in

5

10

10

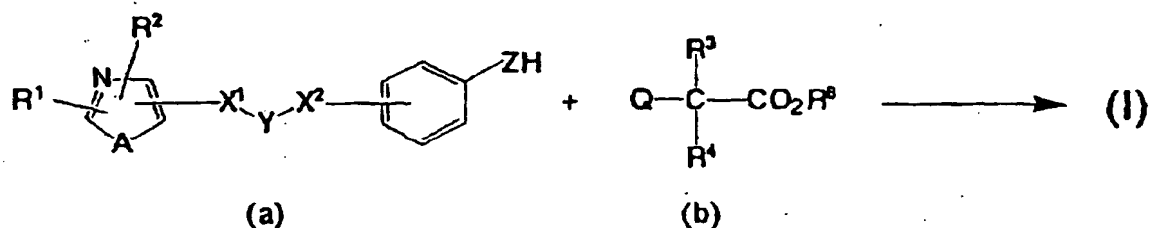
10

0048] Further, the compounds of the invention can be in the form of pharmaceutically acceptable salts such as alkali metal salts, e.g., sodium salt and potassium salt.

0049] The processes for preparing the compound of the formula (I) according to the invention are described below.

Synthetic process 1]

2050]



35

40

45

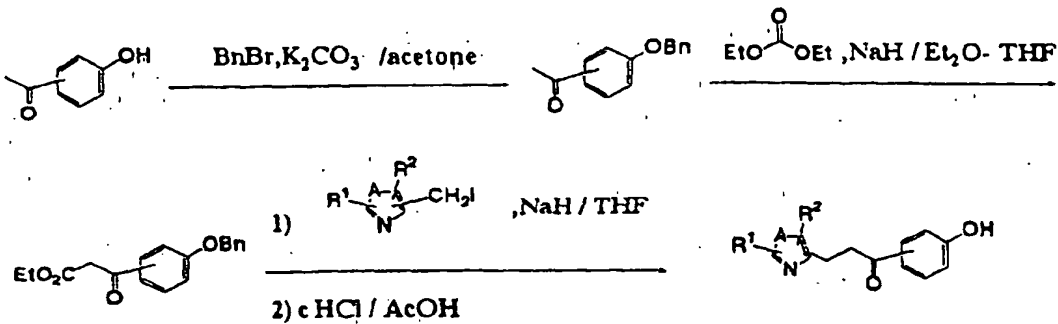
50

55

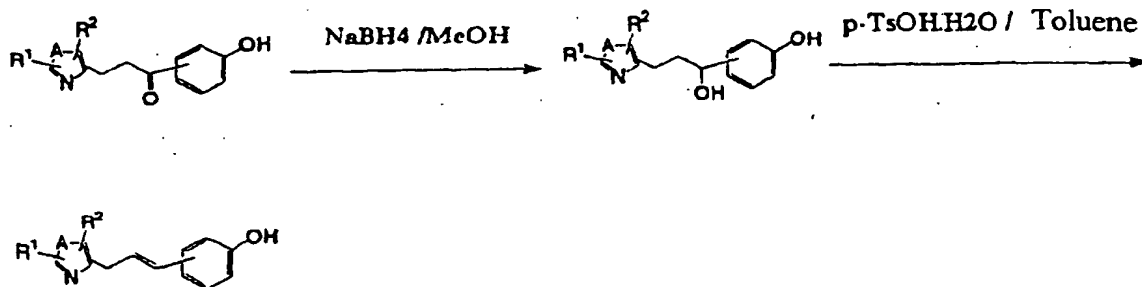
[Synthesis example 1 for starting compound]

[0053]

(1)



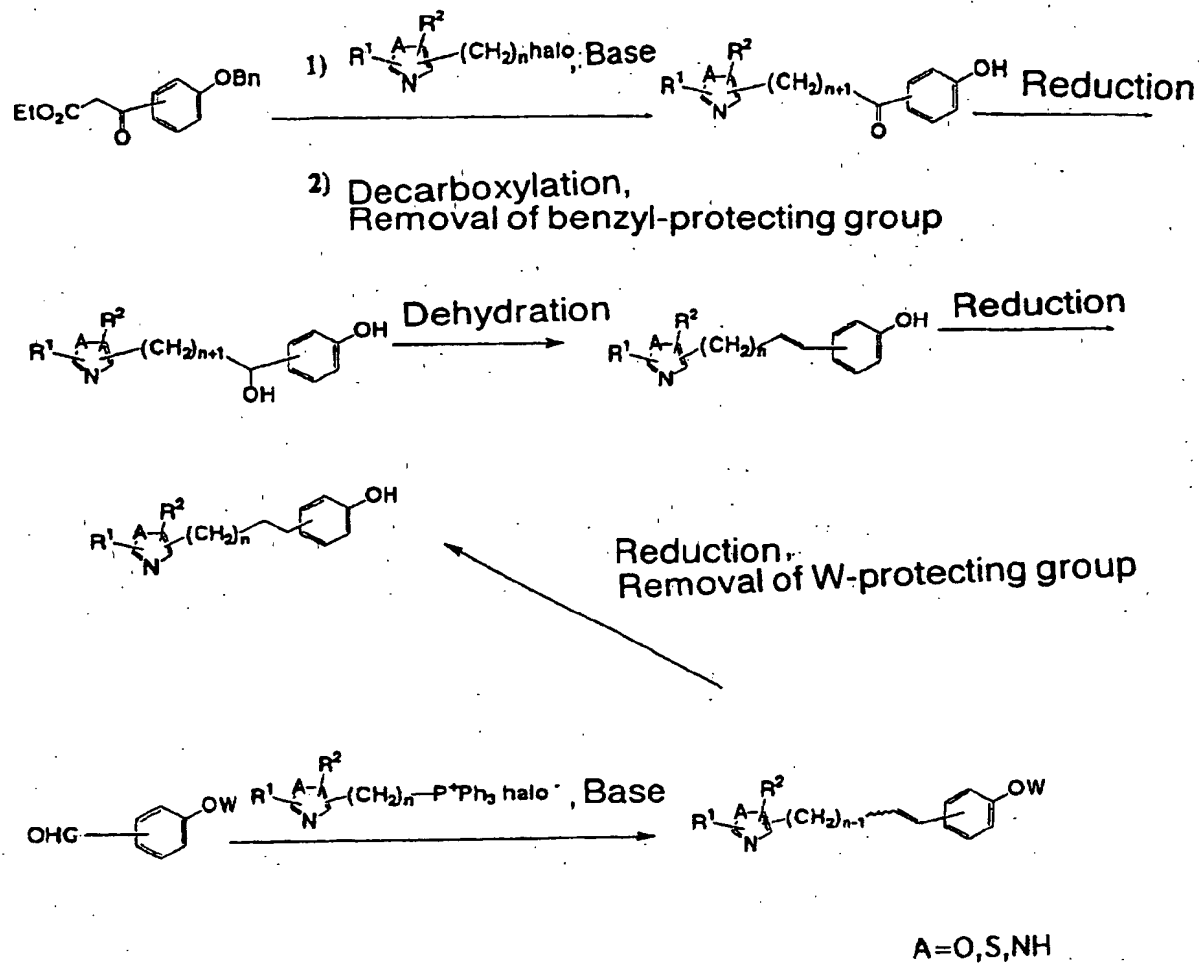
(2)

[in the formulas, Bn is benzyl, and R¹, R² and A are those described hereinbefore.]

[0054] Further, the following synthetic schemes 2 and 3 can be utilized:

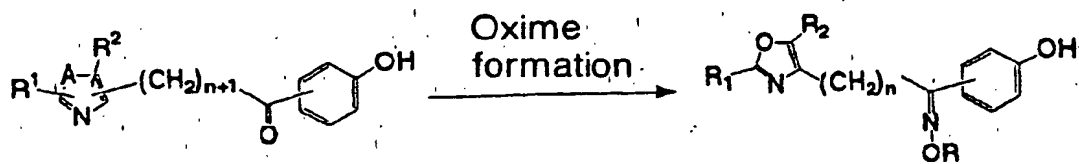
[Synthesis example 2 for starting compound]

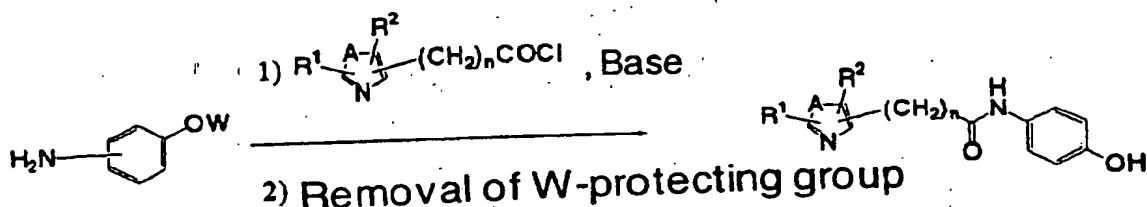
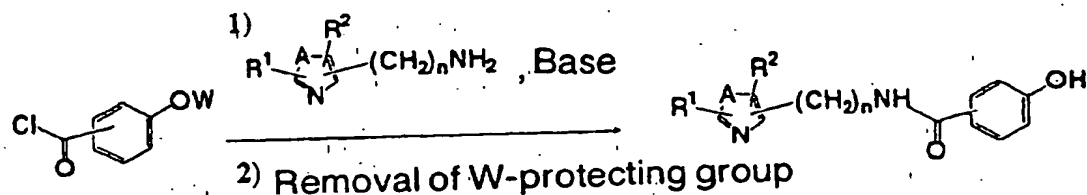
[0055]



[Synthesis example 3 for starting compound]

[0056]





25 $\text{R}=\text{H}, \text{Me}$ etc

30 $\text{W}=\text{Protecting group}$

35 $\text{A}=\text{O}, \text{S}, \text{NH}$

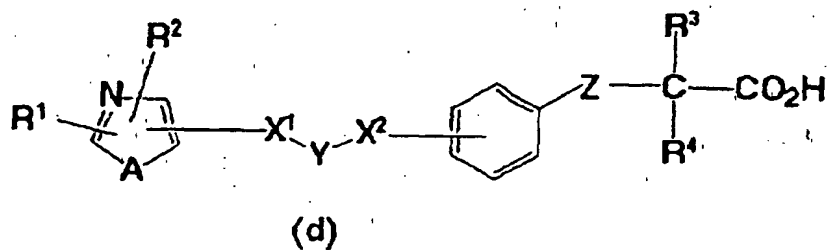
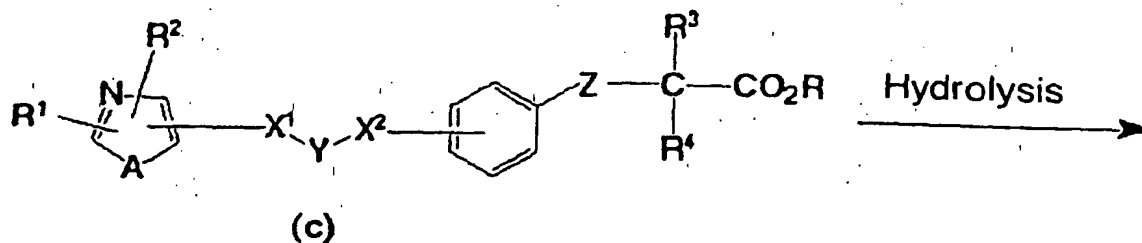
[in the formulas, Bn is benzyl, halo is halogen, n is an integer, W is a protective group for benzyl, and R¹ and R² are those described hereinbefore.]

[0057] In the above-illustrated synthesis example 2 for starting compound, the ethyl 2-benzoylacetate derivative is condensed with a halogen derivative, and the resulting ketone compound is decarbonized and then subjected to removal of the protecting group from benzyl, to give a phenol compound having an acyl substituent. The acyl-substituted phenol compound can be converted into a (1-hydroxyalkyl)phenol compound by means of a reducing agent such as NaBH₄ or LiAlH₄. Then, the (1-hydroxyalkyl)phenol compound can be converted into an olefin-substituted phenol compound by means of a halogenating reagent, a sulfonating reagent or a dehydrating reagent under acidic conditions using sulfuric acid. The olefin-substituted phenol compound can be obtained by a reaction between benzaldehyde and Wittig reagent. The olefin-substituted phenol compound can be converted into an alkyl-substituted phenol compound by catalytic reduction in a solvent such as ethanol in the presence of a catalyst such as Pd-C.

[0058] Further, the acyl-substituted phenol compound can be converted into an oxime compound utilizing the process illustrated in the synthesis example 3 for starting compound. Furthermore, a carbamoyl-substituted phenol compound can be obtained by the reaction with an amine and a benzoic chloride derivative (if required, a protective group is removed). An acylamino-substituted phenol compound is also obtained by the reaction with an acyl chloride and aniline (if required, a protective group is removed).

[Synthetic process 2]

[0059]

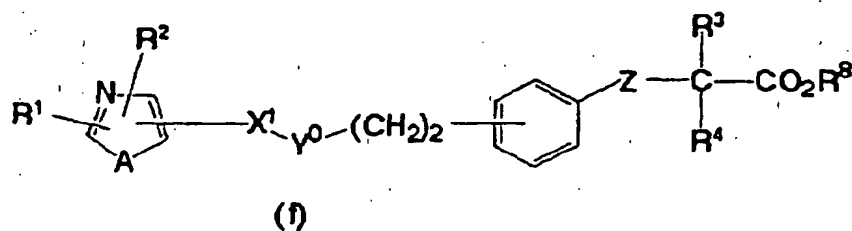
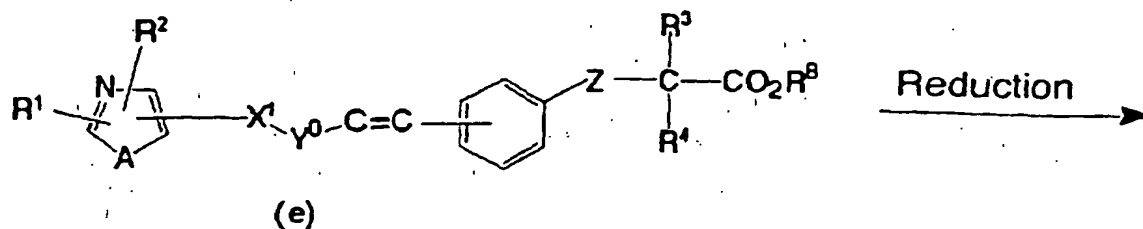


[in the formulas, R is C₁₋₆ alkyl such as methyl or ethyl, and R¹, R², R³, R⁴, A, X¹, X², Y and Z are those described hereinbefore].

[0060] In the above-illustrated process for preparation, a compound of the formula (I) (R⁸=H) according to the invention can be obtained by the ester compound of the formula (c) is hydrolyzed in a solvent such as aqueous ethanol in the presence of a base such as sodium hydroxide, potassium hydroxide or lithium hydroxide.

[Synthetic process 3]

[0061]

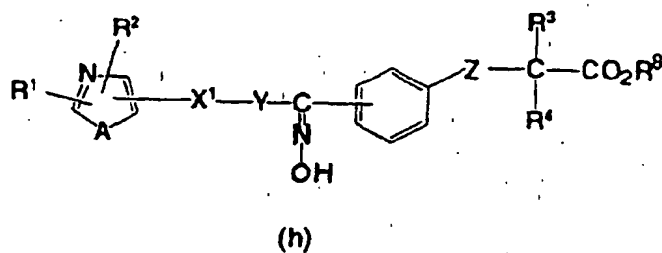
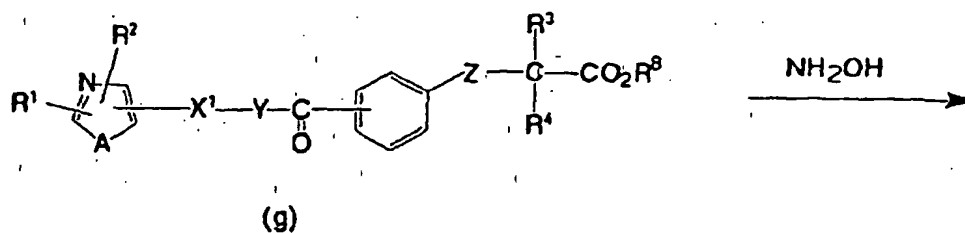


[in the formulas, Y⁰ is a C₁₋₆ alkylene chain or a bond, and R¹, R², R³, R⁴, A, X¹ and Z are those described hereinbefore].

[0062] In the above-illustrated process, a compound of the formula (f) (X²=bond) according to the invention can be obtained by subjecting the olefin compound of the formula (e) to a reduction reaction in ethanol in the presence of a catalyst such as Pt-C.

[Synthetic process 4]

[0063]



[in the formulas, R¹, R², R³, R⁴, R⁸, A, X¹, Y and Z are those described hereinbefore].

[0064] In the above-illustrated process, a compound of the formula (I) ($X^2=C(=N-OH)$) according to the invention can be obtained by reacting the ketone compound of the formula (g) with hydroxylamine.

[0065] The representative compounds of the invention are described below.

5 (1-1) Compounds of the following formula (I-a)

[0066] Compounds of the formula (I) in which A is O, Z is O, R^8 is H, and X^1 is attached to the 4-position of the oxazole ring.

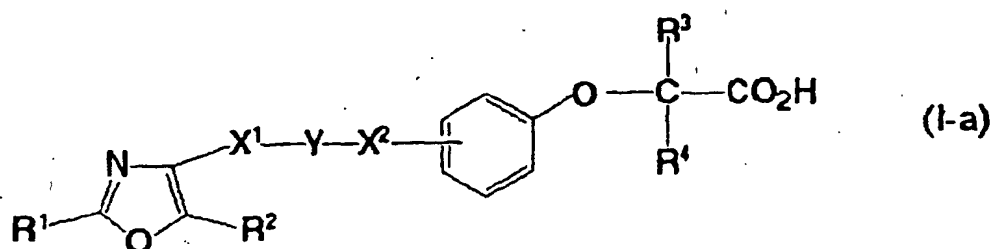


Table 1

R ¹	R ²	R ³	R ⁴	X ¹	Y	X ²
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(4-Cl)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O-OH(4)
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=(OH)(4)
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂ CH ₂	bond(4)
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	CH=CH(4)
phenyl	methyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-pyridyl	ethyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-naphthyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	bond (4)
cyclohexyl	butyl	methyl	methyl	bond	CH ₂ CH ₂	NHC=O(4)
(2-Cl)phenyl	propyl	ethyl	methyl	bond	CH ₂ CH ₂	CH=CH(4)
(2-Cl)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C(OH)(4)
(2,4-Cl)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=N-OH(4)
(2-Bu)phenyl	hexyl	methyl	methyl	bond	CH ₂ CH ₂ CH ₂	C=O(4)
(4-tBu)phenyl	hexyl	methyl	methyl	O	CH ₂ CH ₂	O(3)

Remark: Numeral in () means a position of X².

45 (1-2) Compounds of the above-illustrated formula (I-a)

[0067]

Table 2

R ¹	R ²	R ³	R ⁴	X ¹	Y	X ²
(2-Cl)phenyl	t-butyl	ethyl	ethyl	NHCO	CH ₂ CH ₂	C=O(3)
(2-Cl)phenyl	isopropyl	methyl	methyl	CONH	CH ₂ CH ₂	C=O(3)
(2,3-F)phenyl	isobutyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2,4-F)phenyl	trifluoromethyl	methyl	methyl	bond	CH ₂ CH ₂	NHC=O(3)
(2,3-F)phenyl	trifluoroethyl	methyl	methyl	bond	CH ₂ CH ₂	CH=CH(3)
(2,4-F)phenyl	difluoroethyl	methyl	methyl	bond	CH ₂ CH ₂	C(OMe) (3)

Table 2 (continued)

R ¹	R ²	R ³	R ⁴	X ¹	Y	X ²
(2-CF ₃)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2,6-Cl)phenyl	isopropyl	difluoro	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-Cl)phenyl	cyclopropyl	fluoromethyl	methyl	bond	CH=CH	C=O(4)
(2,3-F)phenyl	2-propenyl	methyl	methyl	bond	CH ₂	C=O(4)
(2,3-Cl)phenyl	vinyl	methyl	methyl	bond	CH ₂ CH=CH	C=O(4)
(2,3-Cl)phenyl	2-propenyl	methyl	methyl	bond	CH ₂	C=O(4)
(2,4-F)phenyl	propargyl	methyl	methyl	bond	CH ₂	C=ONH(4)
hexyl	cyclopropylmethyl	methyl	methyl	bond	CH ₂ CH ₂ CH ₂	C=O(3)
2-quinolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂ CH ₂	bond(3)
(2-Cl)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C(OH)(4)
(2-Cl)phenyl	isopropyl	ethyl	methyl	bond	CH ₂	CH=CH(3)
(2-OMe)phenyl	isopropyl	ethyl	methyl	bond	CH ₂ CH ₂	NHCO(4)
(2-Me)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂ CH ₂	C=O(4)
(4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)

Remark: Numeral in () means a position of X².

(2) Compounds of the following formula (I-b)

[0068] Compounds of the formula (I) in which A is O, Z is S, R⁸ is H, and X¹ is attached to the 4-position of the oxazole ring.

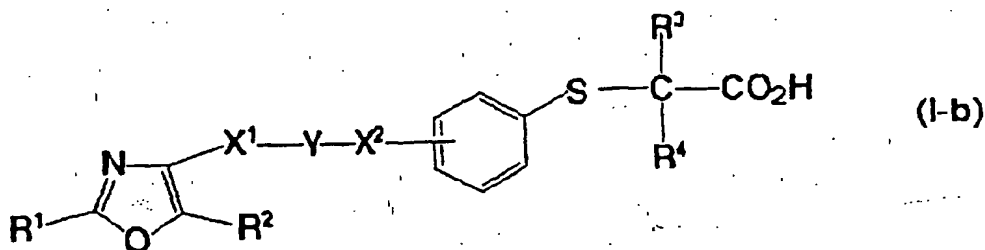


Table 3

R ¹	R ²	R ³	R ⁴	X ¹	Y	X ²
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(4-Cl)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=N-OH(4)
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	CH(OH)(4)
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂ CH ₂	bond(4)
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	CH=CH(4)
phenyl	methyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-pyridyl	ethyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-naphthyl	propyl	methyl	methyl	bond	CH ₂ CH ₂ CH ₂	bond(4)
cyclohexyl	butyl	methyl	methyl	bond	CH ₂ CH ₂	NHC=O(4)
(2-Cl)phenyl	propyl	ethyl	methyl	bond	CH ₂	CH=CH(4)
(2-Cl)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	CH(OH)(4)
(2,4-Cl)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=N-OH(4)

Remark: Numeral in () means a position of X².

(3-1) Compounds of the following formula (I-c)

[0069] Compounds of the formula (I) in which A is not O, each of R³ and R⁴ is methyl, Z is O, R⁸ is H, and X¹ is attached, for example, to the 4-position of the thiazole ring.

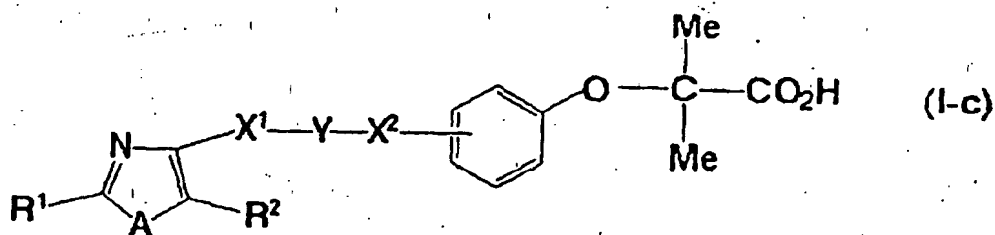


Table 4

R ¹	R ²	A	X ¹	Y	X ²
(2-Cl)phenyl	isopropyl	S	bond	CH ₂ CH ₂	C=O(4)
(4-Cl)phenyl	propyl	S	bond	CH ₂ CH ₂	C=O(4)
(2-Cl)phenyl	isopropyl	NH	bond	CH ₂ CH ₂	C=N-OH(4)
(2-Cl)phenyl	isopropyl	N-Me	bond	CH ₂ CH ₂	CH(OH)(4)
(2-Cl)phenyl	isopropyl	N-Et	bond	CH ₂ CH ₂ CH ₂	bond(4)
(2-Cl)phenyl	isopropyl	N-Bn	bond	CH ₂ CH ₂	CH=CH(4)
phenyl	methyl	S	bond	CH ₂ CH ₃	C=O(4)
2-pyridyl	ethyl	S	bond	CH ₂ CH ₂	C=O(4)
2-naphthyl	propyl	NH	bond	CH ₂ CH ₂	bond(4)
cyclohexyl	butyl	N-Me	bond	CH ₂ CH ₂	NHC=O(4)
(2-Cl)phenyl	propyl	N-Et	bond	CH ₂ CH ₂	CH=CH(4)
(2-Cl)phenyl	propyl	N-Bn	bond	CH ₂ CH ₂	CH(OH)(4)
(2,4-Cl)phenyl	propyl	S	bond	CH ₂ CH ₂	C=N-OH(4)
(4-Bu)phenyl	hexyl	NH	bond	CH ₂ CH ₂ CH ₂	C=O(4)
(4-tBu)phenyl	hexyl	N-Me	O	CH ₂ CH ₂	O(3)
(2-Cl)phenyl	t-butyl	N-Et	NHCO	CH ₂ CH ₂	C=O(3)

Remark: Numeral in () means a position of X².

(3-2) Compounds of the above-illustrated formula (I-c)

[0070]

Table 5

R ¹	R ²	A	X ¹	Y	X ²
(2-Cl)phenyl	isopropyl	N-Bn	CONH	CH ₂ CH ₂	C=O(3)
(2,3-F)phenyl	isobutyl	S	bond	CH ₂ CH ₂	C=O(3)
(2,4-F)phenyl	trifluoro-methyl	S	bond	CH ₂ CH ₂	NHC=O(3)
(2,3-F)phenyl	trifluoro-ethyl	NH	bond	CH ₂ CH ₂	CH=CH(4)
(2,4-F)phenyl	difluoro-ethyl	N-Me	bond	CH ₂ CH ₂	C(CMe)(3)
(2-CF ₃)phenyl	isopropyl	N-Et	bond	CH ₂ CH ₂	C=O(4)
(2,6-Cl)phenyl	isopropyl	N-Bn	bond	CH ₂ CH ₂	C=O(4)
(2-Cl)phenyl	cyclopropyl	S	bond	CH=CH	C=O(4)
(2,3-F)phenyl	2-propenyl	S	bond	CH ₂	C=O(4)

Table 5 (continued)

R ¹	R ²	A	X ¹	Y	X ²
(2,3-Cl)phenyl	vinyl	NH	bond	CH ₂ CH=CH	C=O(4)
(2,3-Cl)phenyl	2-propenyl	N-Me	bond	CH ₂	C=O(4)
(2,4-F)phenyl	propargyl	N-Et	bond	CH ₂	C=ONH(3)
hexyl	cyclopropyl-methyl	N-Bn	bond	CH ₂ CH ₂ CH ₂	C=O(3)
2-quinolyl	isopropyl	S	bond	CH ₂ CH ₂ CH ₂	bond(3)
(2-Cl)phenyl	isopropyl	S	bond	CH ₂	CH=CH(3)
(2-OMe)phenyl	isopropyl	S	bond	CH ₂ CH ₂	NHCO(3)
(2-OMe)phenyl	isopropyl	S	bond	CH ₂ CH ₂ CH ₂	C=O(4)
(4-Cl)phenyl	isopropyl	S	bond	CH ₂ CH ₂	C=O(4)

Remark: Numeral in () means a position of X².

(4-1) Compounds of the following formula (I-d)

[0071] Compounds of the formula (I) in which each of R³ and R⁴ is methyl, Z is O, R⁸ is H, and X¹ is attached, for example, to the 4-position of the thiazole ring.

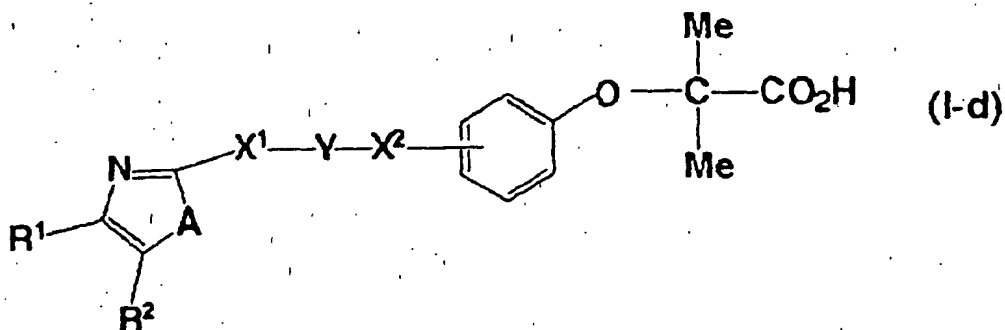


Table 6

R ¹	R ²	A	X ¹	Y	X ²
(2-Cl)phenyl	isopropyl	O	bond	CH ₂ CH ₂	C=O(4)
(4-Cl)phenyl	propyl	O	bond	CH ₂ CH ₂	C=O(4)
(2-Cl)phenyl	isopropyl	O	bond	CH ₂ CH ₂	C=N-OH(4)
(2-Cl)phenyl	isopropyl	O	bond	CH ₂ CH ₂	CH(OH) (4)
(2-Cl)phenyl	isopropyl	O	bond	CH ₂ CH ₂ CH ₂	bond(4)
(2-Cl)phenyl	isopropyl	O	bond	CH ₂ CH ₂	CH=CH(4)
phenyl	methyl	S	bond	CH ₂ CH ₂	C=O(4)
2-pyridyl	ethyl	S	bond	CH ₂ CH ₂	C=O(4)
2-naphthyl	propyl	O	bond	CH ₂ CH ₂	bond(4)
cyclohexyl	butyl	O	bond	CH ₂ CH ₂	NHC=O(4)
(2-Cl)phenyl	propyl	O	bond	CH ₂ CH ₂	CH=CH(4)
(2-Cl)phenyl	propyl	O	bond	CH ₂ CH ₂	CH(OH) (4)
(2,4-Cl)phenyl	propyl	O	bond	CH ₂ CH ₂	C=N-OH(4)
(4-Bu)phenyl	hexyl	S	bond	CH ₂ CH ₂ CH ₂	C=O(4)
(4-tBu)phenyl	hexyl	N-Me	bond	CH ₂ CH ₂ CH ₂	O(3)
(2-Cl)phenyl	t-butyl	N-Et	NHCO	CH ₂ CH ₂	C=O(3)

Remark: Numeral in () means a position of X².

(4-2) Compounds of the above-illustrated formula (I-d)

[0072]

Table 7

R ¹	R ²	A	X ¹	Y	X ²
(2-Cl)phenyl	isopropyl	N-Bn	CONH	CH ₂ CH ₂	C=O(3)
(2,3-F)phenyl	isobutyl	O	bond	CH ₂ CH ₂	C=O(3)
(2,4-F)phenyl	trifluoromethyl	O	bond	CH ₂ CH ₂	NHC=O(3)
(2,3-F)phenyl	trifluoroethyl	O	bond	CH ₂ CH ₂	CH=CH(3)
(2,4-F)phenyl	difluoroethyl	O	bond	CH ₂ CH ₂	C(OMe) (3)
(2-CF ₃)phenyl	isopropyl	O	bond	CH ₂ CH ₂	C=O(4)
(2,4-Cl)phenyl	isopropyl	O	bond	CH ₂ CH ₂	C=O(4)
(2-Cl)phenyl	cyclopropyl	O	bond	CH=CH	C=O(4)
(2,3-F)phenyl	2-propenyl	S	bond	CH ₂	C=O(4)
(2,3-Cl)phenyl	vinyl	NH	bond	CH ₂ CH=CH	C=O(4)
(2,3-Cl)phenyl	2-propenyl	N-Me	bond	CH ₂	C=O(4)
(2,4-F)phenyl	propargyl	N-Et	bond	CH ₂	C=ONH(3)
hexyl	cyclopropyl-	N-Bn	bond	CH ₂ CH ₂ CH ₂	C=O(3)
2-quinolyl	isopropyl	S	bond	CH ₂ CH ₂ CH ₂	bond(3)
(2-Cl)phenyl	isopropyl	S	bond	CH ₂	CH=CH(3)
(2-OMe)phenyl	isopropyl	S	bond	CH ₂ CH ₂	NHCO(3)
(2-Me)phenyl	isopropyl	S	bond	CH ₂ CH ₂ CH ₂	C=O(4)
(4-Cl)phenyl	isopropyl	S	bond	CH ₂ CH ₂ CH ₂	C=O(4)

Remark: Numeral in () means a position of X².

(5-1) Compounds of the following formula (I-e)

[0073] Compounds of the formula (I) in which each of R³ and R⁴ is methyl, Z is O, R⁸ is H, and X¹ is attached, for example, to the 5-position of the thiazole ring.

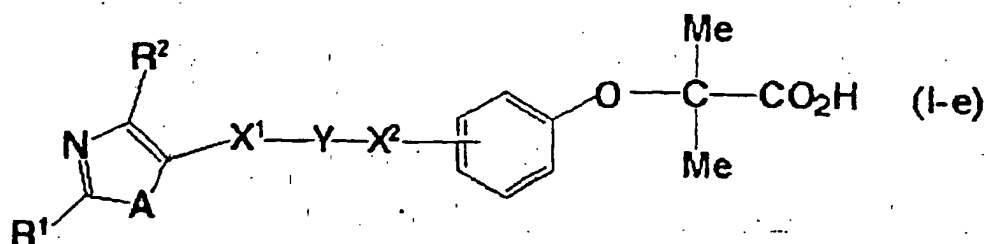


Table 8

R ¹	R ²	A	X ¹	Y	X ²
(2-Cl) phenyl	isopropyl	S	bond	CH ₂ CH ₂	C=O(4)
(4-Cl)phenyl	propyl	S	bond	CH ₂ CH ₂	C=O(4)
(2-Cl)phenyl	isopropyl	NH	bond	CH ₂ CH ₂	C=N-OH(4)
(2-Cl)phenyl	isopropyl	N-Me	bond	CH ₂ CH ₂	CH(OH)(4)
(2-Cl)phenyl	isopropyl	N-Et	bond	CH ₂ CH ₂ CH ₂	bond(4)
(2-Cl)phenyl	isopropyl	N-Bn	bond	CH ₂ CH ₂	CH=CH(4)
phenyl	methyl	S	bond	CH ₂ CH ₂	C=O(4)

Table 8 (continued)

R ¹	R ²	A	X ¹	Y	X ²
2-pyridyl	ethyl	S	bond	CH ₂ CH ₂	C=O(4)
2-naphthyl	propyl	NH	bond	CH ₂ CH ₂	bond (4)
cyclohexyl	butyl	N-Me	bond	CH ₂ CH ₂	NHC=O(4)
(2-Cl)phenyl	propyl	N-Et	bond	CH ₂ CH ₂	CH=CH(4)
(2-Cl)phenyl	propyl	N-Bn	bond	CH ₂ CH ₂	CH(OH)(4)
(2,4-Cl)phenyl	propyl	S	bond	CH ₂ CH ₂	C=N-OH(4)
(4-Bu)phenyl	hexyl	NH	bond	CH ₂ CH ₂ CH ₂	C=O(4)
(4-tBu)phenyl	hexyl	N-Me	O	CH ₂ CH ₂	O(3)
(2-Cl)phenyl	t-butyl	N-Et	NHCO	CH ₂ CH ₂	C=O(3)

Remark: Numeral in () means a position of X².

(5-2) Compounds of the above-illustrated formula (I-e)

[0074]

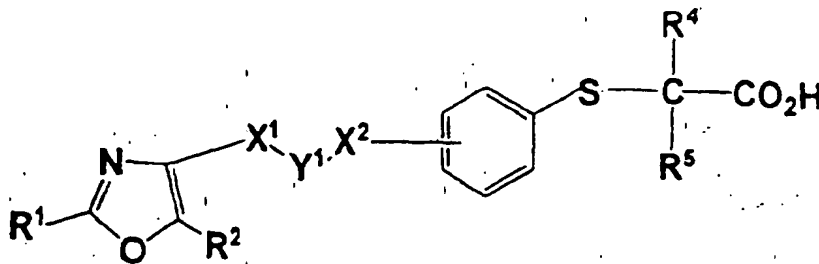
Table 9

R ¹	R ²	A	X ¹	Y	X ²
(2-Cl)phenyl	isopropyl	N-Bn	COHN	CH ₂ CH ₂	C=O(3)
(2,3-F)phenyl	isobutyl	S	bond	CH ₂ CH ₂	C=O(3)
(2,4-F)phenyl	trifluoromethyl	S	bond	CH ₂ CH ₂	NHC=O(3)
(2,3-F)phenyl	trifluoroethyl	NH	bond	CH ₂ CH ₂	CH=CH(3)
(2,4-F)phenyl	difluoroethyl	N-Me	bond	CH ₂ CH ₂	C(OMe) (3)
(2-CF ₃)phenyl	isopropyl	N-Et	bond	CH ₂ CH ₂	C=O(4)
(2,6-Cl)phenyl	isopropyl	N-Bn	bond	CH ₂ CH ₂	C=O(4)
(2-Cl)phenyl	cyclopropyl	S	bond	CH=CH	C=O(4)
(2,3-F)phenyl	2-propenyl	S	bond	CH ₂	C=O(4)
(2,3-Cl)phenyl	vinyl	NH	bond	CH ₂ CH=CH	C=O(4)
(2,3-Cl)phenyl	2-propenyl	N-Me	bond	CH ₂	C=O(4)
(2,4-F)phenyl	propargyl	N-Et	bond	CH ₂	C=ONH(3)
hexyl	cyclopropylmethyl	N-Bn	bond	CH ₂ CH ₂ CH ₂	C=O(3)
2-quinolyl	isopropyl	S	bond	CH ₂ CH ₂ CH ₂	bond(3)
(2-Cl)phenyl	isopropyl	S	bond	CH ₂	CH=CH(3)
(2-CMe)phenyl	isopropyl	S	bond	CH ₂ CH ₂	NHCO(3)
(2-OMe)phenyl	isopropyl	S	bond	CH ₂ CH ₂ CH ₂	C=O(4)
(4-Cl)phenyl	isopropyl	S	bond	CH ₂ CH ₂	C=O(4)

Remark: Numeral in () means a position of X².

(6) Oxazole derivatives of the following formula:

[0075]



EP 1 310 494 A1

[in the formula, R¹, R², R⁴, R⁵, X¹, X² and Y¹ are those described in Tables 10 to 15].

Table 10

R ¹	R ²	R ⁴	R ⁵	X ¹	Y ¹	X ²
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ NH	C=O(4)
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ C=O	NH(4)
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂ CH ₂	C=O(4)
(2,4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2,4-Cl)phenyl	isopropyl	methyl	ethyl	bond	CH ₂ CH ₂	C=O(4)
(3,4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-benzofuranyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
4-biphenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
1-OH-2-naphthyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2,4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂	C=O(4)
3-OH-2-naphthyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH, 4-Cl)-phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-Cl,4-Br)-phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
3-Cl-4-bi-phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH, 4-Me)-phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2,4-Me)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH,3,4-Me)-phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH,4-CF ₃)-phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-Cl,4-OMe)-phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)

Remark: Numeral in () means a position of X².

Table 11

R ¹	R ²	R ⁴	R ⁵	X ¹	Y ¹	X ²
(2-Cl,4-OPh)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
1-naphthyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-naphthyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-quinolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
8-quinolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
3-quinolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-pyrimidyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-thienyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-furanyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-imidazolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-indolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-benzothienyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-benzimidazolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH,4-Me)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2,4-Me)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH,3,4-Me)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH,4-CF ₃)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-Cl,4-OMe)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-Cl,4-OPh)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)

Remark: Numeral in () means a position of X².

Table 12

R ¹	R ² ,	R ⁴	R ⁵	X ¹	Y ¹	X ²
1-naphthyl	propyl	methyl	methy	bond	CH ₂ CH ₂	C=O(4)
2-naphthyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-quinolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
8-quinolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
3-quinolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-pyrimidyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-thienyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-furanyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-imidazolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-indolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-benzothienyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-benzimidazolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ NH	C=O(4)
(4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ C=O	NH(3)
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂ CH ₂	C=O(3)
(2,4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2,4-Cl)phenyl	isopropyl	methyl	ethyl	bond	CH ₂ CH ₂	C=O(3)
(3,4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-benzofuranyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
4-biphenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)

Remark: Numeral in () means a position of X².

Table 13

R ¹	R ²	R ⁴	R ⁵	X ¹	Y ¹	X ²
1-OH-2-naphthyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2,4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	CH=CH(3)
3-OH-2-naphthyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH, 4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-Cl,4-Br)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
3-Cl-4-biphenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH,4-Me)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2,4-Me)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH,3,4-Me)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH,4-CF ₃)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-Cl,4-OMe)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-Cl,4-OPh)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
1-naphthyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-naphthyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-quinolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
8-quinolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
3-quinolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-pyrimidyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)

Remark: Numeral in () means a position of X².

Table 14

R ¹	R ²	R ⁴	R ⁵	X ¹	Y ¹	X ²
2-furanyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-imidazolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-indolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-benzothienyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-benzimidazolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH,4-Me)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2,4-Me)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH,3',4-Me)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH,4-CF ₃)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-Cl,4-OMe)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-Cl,4-OPh)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
1-naphthyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-naphthyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-quinolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
8-quinolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
3-quinolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-pyrimidyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-thienyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-furanyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)

Remark: Numeral in () means a position of X².

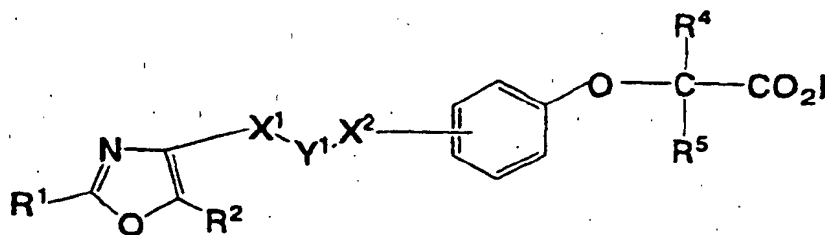
Table 15

R ¹	R ²	R ⁴	R ⁵	X ¹	Y ¹	X ²
2-imidazolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-indolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-benzothienyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-benzimidazolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)

Remark: Numeral in () means a position of X².

(7) Oxazole derivatives of the following formula:

[0076]



[in the formula, R¹, R², R⁴, R⁵, X¹, X² and Y¹ are those described in Tables 16 to 21].

Table 16

R ¹	R ²	R ⁴	R ⁵	X ¹	Y ¹	X ²
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ NH	C=O(4)
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ C=O	NH(4)
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂ CH ₂	C=O(4)
(2,4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2,4-Cl)phenyl	isopropyl	methyl	ethyl	bond	CH ₂ CH ₂	C=O(4)
(3,4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-benzofuranyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
4-biphenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
1-OH-2-naphthyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2,4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂	C=O(4)
3-OH-2-naphthyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH, 4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-Cl,4-Br)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
3-Cl-4-biphenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH,4-Me)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2,4-Me)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH) phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH,3,4-Me)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH,4-CF ₃)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-Cl,4-OMe)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
Remark: Numeral in () means a position of X ² .						

Table 17

R ¹	R ²	R ⁴	R ⁵	X ¹	Y ¹	X ²
(2-Cl,4-OPh)-phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
1-naphthyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-naphthyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-quinolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
8-quinolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
3-quinolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-pyrimidyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-thienyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-furanyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-imidazolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-indolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-benzothienyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-benzimidazolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH,4-Me)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2,4-Me)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH,3,4-Me)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH,4-CF ₃)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-Cl,4-OMe)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-Cl,4-OPh)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
Remark: Numeral in () means a position of X ² .						

Table 18

R ¹	R ²	R ⁴	R ⁵	X ¹	Y ¹	X ²
1-naphthyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-naphthyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-quinolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
8-quinolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
3-quinolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-pyrimidyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-thienyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-furanyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-imidazolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-indolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-benzothienyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-benzimidazolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ NH	C=O(4)
(4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ C=O	NH(3)
(2-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂ CH ₂	C=O(3)
(2,4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2,4-Cl)phenyl	isopropyl	methyl	ethyl	bond	CH ₂ CH ₂	C=O(3)
(3,4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-benzofuranyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
4-biphenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)

Remark: Numeral in () means a position of X².

Table 19

R ¹	R ²	R ⁴	R ⁵	X ¹	Y ¹	X ²
1-OH-2-naphthyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2,4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	CH=CH(3)
3-OH-2-naphthyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH,4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-Cl,4-Br)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
3-Cl-4-biphenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH,4-Me)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2,4-Me)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH,3,4-Me)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH,4-CF ₃)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-Cl,4-OMe)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-Cl,4-OPh)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
1-naphthyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-naphthyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-quinolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
8-quinolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
3-quinolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-pyrimidyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-thienyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)

Remark: Numeral in () means a position of X².

Table 20

R ¹	R ²	R ⁴	R ⁵	X ¹	Y ¹	X ²
2-furanyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-imidazolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-indolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-benzothienyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-benzimidazolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH,4-Me)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2,4-Me)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH,3,4-Me)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-OH,4-CF ₃)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-Cl,4-OMe)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(2-Cl,4-OPh) phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
1-naphthyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-naphthyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-quinolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
8-quinolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
3-quinolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-pyrimidyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-thienyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-furanyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
Remark: Numeral in () means a position of X ² .						

Table 21

R ¹	R ²	R ⁴	R ⁵	X ¹	Y ¹	X ²
2-imidazolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-indolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-benzothienyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
2-benzimidazolyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
Remark: Numeral in () means a position of X ² .						

(8) Thiazole derivatives of the following formula:

[0077] The compounds of the aforementioned general formula (I) in which A is S, and Z is S.

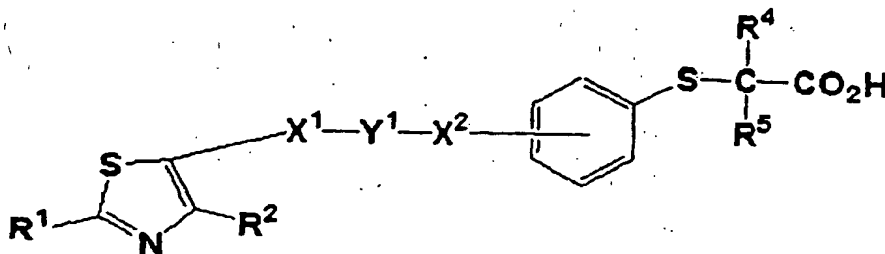


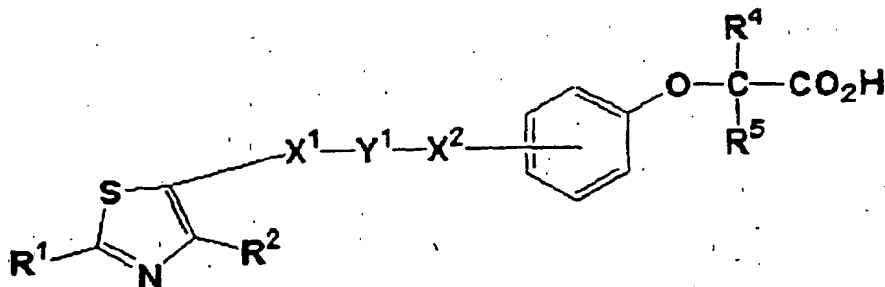
Table 22

R ¹	R ²	R ⁴	R ⁵	X ¹	Y ¹	X ²
(4-CF ₃)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(4-Me)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(4-CMe)phenyl	butyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(4-OPh)phenyl	hexyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(4-OCF ₃)phenyl	isopropyl	methyl	Methyl	bond	CH ₂ CH ₂	C=O(4)
4-biphenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(3-Me)phenyl	butyl	methyl	methyl	bond	CH ₂	C=O(4)
(3-Cl)phenyl	hexyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(3,4-OMe)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(3,4-Me)phenyl	propyl	methyl	methyl	bond	CH ₂	CH=CH(4)
(3,4-Cl)phenyl	butyl	methyl	ethyl	bond	CH ₂ CH ₂	C=O(4)
(2,4-Me)phenyl	hexyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2,4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH,3,4-Me)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2,4-F)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH,4-CF ₃)phenyl	isopropyl	methyl	ethyl	bond	CH ₂ CH ₂	C=O(3)
(2-F,4-CMe)phenyl	isopropyl	methyl	propyl	bond	CH ₂ CH ₂	CH=CH(4)
(2-F,4-OPh)phenyl	isopropyl	methyl	methyl	bond	CH ₂	C=O(4)
1-naphthyl	isopropyl	methyl	propyl	bond	CH ₂	CH=CH(4)

Remark: Numeral in () means a position of X².

(9) Thiazole derivatives of the following formula:

[0078] The compounds of the aforementioned general formula (I) in which A is S, and Z is O.



[in the formula, R¹, R², R⁴, R⁵, X¹, X² and Y¹ are those described in Tables 23 and 24].

Table 23

R ¹	R ²	R ⁴	R ⁵	X ¹	Y ¹	X ²
(4-CF ₃)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(4-Me)phenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(4-OMe)phenyl	butyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(4-OPh)phenyl	hexyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(4-OCF ₃)phenyl	isopropyl	methyl	ethyl	bond	CH ₂ CH ₂	C=O(4)
4-biphenyl	propyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(3-Me)phenyl	butyl	methyl	methyl	bond	CH ₂	C=O(4)
(3-Cl)phenyl	hexyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(3)
(3,4-OMe)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)

Table 23 (continued)

R ¹	R ²	R ⁴	R ⁵	X ¹	Y ¹	X ²
(3,4-Me)phenyl	propyl	methyl	methyl	bond	CH ₂	CH=CH(4)
(3,4-Cl)phenyl	butyl	methyl	ethyl	bond	CH ₂ CH ₂	C=O(4)
(2,4-Me)phenyl	hexyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2,4-Cl)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH,3,4-Me)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(2,4-F)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
(3,4,5-Me)phenyl	isopropyl	methyl	ethyl	bond	CH ₂ CH ₂	C=O(4)
(2-OH, 3,4-Me)phenyl	isopropyl	methyl	propyl	bond	CH ₂ CH ₂	C=O(4)

Remark: Numeral in () means a position of X².

Table 24

R ¹	R ²	R ⁴	R ⁵	X ¹	Y ¹	X ²
(2-OH, 4-CF ₃)phenyl	isopropyl	methyl	ethyl	bond	CH ₂ CH ₂	C=O(3)
(2-Cl,4-CMe)phenyl	isopropyl	methyl	propyl	bond	CH ₂ CH ₂	C=O(4)
(2-Cl,4-OPh)phenyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
1-naphthyl	isopropyl	methyl	methyl	bond	CH ₂	CH=CH(4)
2-naphthyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-quinolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
8-quinolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
3-quinolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-pyrimidyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-thienyl	isopropyl	methyl	methyl	bond	CH ₂	CH=CH(4)
2-furanyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-imidazolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-indolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-benzofuranyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-benzothieryl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)
2-benzimidazolyl	isopropyl	methyl	methyl	bond	CH ₂ CH ₂	C=O(4)

Remark: Numeral in () means a position of X².

[0079] The pharmacological effects of the invention are described below.

[0080] The PPAR δ activating effect of the compound of the invention was determined by the following method:

[0081] A chimeric receptor expression plasmid (GAL4-hPPAR δ LED), a reporter plasmid (UASx4-TK-LUC) and β -galactosidase (β -GAL) are transfected into CV-1 cells by utilizing a lipofection reagent DMRIE-C (Life Technologies). Subsequently, it is incubated for 40 hours in the presence of a compound of the invention or a compound for comparison (L-165041), and then the luciferase activity and β -GAL activity are measured on the soluble cells.

[0082] The luciferase activity is calibrated by the β -GAL activity, and a relative ligand activity is calculated under the condition that the luciferase activity of the cells treated by L-165041 is set to 100%). In the same manner, relative ligand activities to PPAR δ and γ transactivation activities are calculated (see the below-mentioned Example 9).

[0083] As seen from Table 25, the compounds of the invention (Examples 1-6) show the same or higher PPAR δ activating effect, as compared with L-165041. The compounds of the invention given in Examples 1 and 5 show activity to PPAR δ selectively higher than activity to PPAR α and γ .

[0084] Further, as seen from Table 26, the compounds of the invention (e.g., Example 7-6) show the same or higher PPAR δ activating effect, as compared with L-165041. Furthermore, the compounds of the invention given in Example 7-12, etc., show activity to PPAR δ selectively higher than activity to PPAR α and γ .

[0085] Furthermore, as seen from Table 27, the compounds of the invention (e.g., Examples 8-1 to 8-4) show the same or higher PPAR δ activating effect, as compared with L-165041.

[0086] Apparently, the compounds of the invention having the general formula (I) show excellent PPAR δ activating effect. Accordingly, these compounds are expected to serve as remedy for prevention and treatment of the following diseases: hyperglycemia, hyperlipidemia, obesity, syndrome X, hyperchlosterolemia, hyperlipoproteinemia, other

dysbolic diseases, hiperlipemia, arterial sclerosis, diseases of cardiovascular systems, hyperphagia, ischemic diseases, malignant tumors such as lung cancer, mammary cancer, colonic cancer, cancer of great intestine, and ovary cancer, Alzheimer's disease, inflammatory disease, osteoporosis (Mano H. et al., (2000) J. Biol. Chem., 175: 8126-8132), Basedow's disease, and adrenal cortical dystrophy.

[0087] The compound of the invention can be administered to human beings by ordinary administration methods such as oral administration or parenteral administration.

[0088] The compound can be granulated in ordinary manners for the preparation of pharmaceuticals. For instance, the compound can be processed to give pellets, granule, powder, capsule, suspension, injection, suppository, and the like.

[0089] For the preparation of these pharmaceuticals, ordinary additives such as vehicles, disintegrators, binders, lubricants, dyes, and diluents. As the vehicles, lactose, D-mannitol, crystalline cellulose and glucose can be mentioned. Further, there can be mentioned starch and carboxymethylcellulose calcium (CMC-Ca) as the disintegrators, magnesium stearate and talc as the lubricants, and hydroxypropylcellulose (HPC), gelatin and polyvinylpyrrolidone (PVP) as the binders.

[0090] The compound of the invention can be administered to an adult generally in an amount of 0.1 mg to 100 mg a day by parenteral administration and 1 mg to 2,000 mg a day by oral administration. The dosage can be adjusted in consideration of age and conditions of the patient.

[0091] The invention is further described by the following non-limiting examples.

[EXAMPLES]

[Example 1] 2-[4-[3-[2-(2-Chlorophenyl)-5-isopropyl-4-oxazolyl] propionyl]phenyloxy]-2-methylpropionic acid (1)
4-[3-[2-(2-Chlorophenyl)-5-isopropyl-4-oxazolyl]propionyl]phenol

[0092] To an ice-cooled THF (5 mL) was added 60% sodium hydride (40 mg, 1.00 mmol). Subsequently, ethyl 2[(4-benzyloxy)benzoyl]acetate (300 mg, 1.00 mmol) was dropwise added for 30 minutes. The mixture was allowed to room temperature, and then stirred for 30 minutes. To the mixture was added 4-iodomethyl-5-isopropyl-2-(2-chlorophenyl)oxazole (362 mg, 1.00 mmol). The resulting mixture was refluxed for 20 hours and nitrogen atmosphere, and allowed to room temperature. THF was removed under reduced pressure. To the residue was added acetic acid (3.0 mL)-conc. hydrochloric acid (0.8 mL), and the mixture was refluxed for 5 hours under heating, and allowed to room temperature. The reaction mixture was poured into ice-cooled water, and the aqueous mixture was extracted with ethyl acetate. The organic layer was collected, washed with a saturated aqueous sodium,hydrogen carbonate solution, water, and brine, dried over anhydrous sodium sulfate, and filtered. The ethyl acetate was removed under reduced pressure, and the residue was purified by silica gel column chromatography (hexane/ethyl acetate = 3/1) to give the desired compound (230 mg) as pale yellowish white crystalline product (yield 65%).

¹H NMR (CDCl₃, 400 MHz) δ : 1.32 (d, 6H, J=7Hz), 2.96 (t, 2H, J=7Hz), 3.15-3.30 (m, 1H), 3.27 (t, 2H, J=7Hz), 6.78 (d, 2H, J=8Hz), 7.1-7.2 (br, 1H), 7.3-7.4 (m, 2H), 7.45-7.50 (m, 1H), 7.79 (d, 2H, J=8Hz), 7.90-7.95 (m, 1H).

(2) Ethyl 2-[4-[3-[2-(2-chlorophenyl)-5-isopropyl-4-oxazolyl] propionyl] phenyloxy]-2-methylpropionate

[0093] In methyl ethyl ketone (5 mL) were suspended the phenol compound obtained in (1) above (220 mg, 0.59 mmol), ethyl 2-bromo-2-methylpropionate (348 mg, 1.78 mmol), and potassium carbonate (246 mg, 1.78 mmol), and the suspension was refluxed for 20 hours. The suspension was then allowed to room temperature, filtered to remove insolubles, and washed with methyl ethyl ketone. The solvent was distilled off. The residue was purified by silica gel column chromatography (hexane/ethyl acetate = 4/1) to give the desired compound (230 mg) as colorless oil (yield 81%).

¹H NMR (CDCl₃, 400 MHz) δ: 1.20 (t, 3H, J=7Hz), 1.30 (d, 6H, J=7Hz), 1.64 (s, 6H), 2.96 (t, 2H, J=7Hz), 3.10-3.25 (m, 1H), 3.34 (t, 2H, J=7Hz), 4.21 (q, 2H, J=7Hz), 6.81 (d, 2H, J=8Hz), 7.3-7.4 (m, 2H), 7.45-7.50 (m, 1H), 7.91 (d, 2H, J=8Hz), 7.90-7.95 (m, 1H).

(3) 2-[4-[3-[2-(2-Chlorophenyl)-5-isopropyl-4-oxazolyl]propionyl]phenyloxy]-2-methylpropionic acid

[0094] In a mixture of ethanol (6mL) and water (3 mL) was dissolved the ester compound obtained in (2) above (220 mg, 0.45 mmol), and then lithium hydroxide monohydrate (40 mg) was added. The mixture was stirred for 20 hours at room temperature. The reaction mixture were neutralized by addition of water and diluted hydrochloric acid, and subjected to extraction using ethyl acetate. The organic layer was collected, washed with water and brine, dried over anhydrous sodium sulfate, and filtered. The ethyl acetate was removed under reduced pressure, to give 150 mg of the desired compound as colorless amorphous residue (yield 72%).

¹H NMR (CDCl₃, 400 MHz) δ: 1.31 (d, 6H, J=7Hz), 1.65 (s, 6H), 2.96 (t, 2H, J=7Hz), 3.15-3.30 (m, 1H), 3.28 (t, 2H, J=7Hz), 6.88 (d, 2H, J=8Hz), 7.3-7.4 (m, 2H), 7.45-7.50 (m, 1H), 7.83 (d, 2H, J=8Hz), 7.9-7.95 (m, 1H).

[Example 2] 2-[4-[3-[2-(4-Chlorophenyl)-5-propyl-4-oxazolyl]propionyl]phenyloxy]-2-methylpropionic acid

[0095] In the same manner as in Example 1, the following intermediates and the desired compound were obtained.

(1) 4-[3-[2-(4-Chlorophenyl)-5-propyl-4-oxazolyl]-propionyl]phenol

Yield: 67%

¹H NMR (CDCl₃, 400 MHz) δ: 0.99 (t, 3H, J=7Hz), 1.65-1.80 (m, 2H), 2.72 (t, 2H, J=7Hz), 2.91 (t, 2H, J=7Hz), 3.28 (t, 2H, J=7Hz), 6.70 (brs, 1H), 6.81 (d, 2H, J=8Hz), 7.39 (d, 2H, J=8Hz), 7.81 (d, 2H, J=8Hz), 7.90 (d, 2H, J=8Hz).

(2) Ethyl 2-[4-[3-[2-(4-chlorophenyl)-5-propyl-4-oxazolyl]propionyl]phenyloxy]-2-methylpropionate

[0096] Yield: 59%

¹H NMR (CDCl₃, 400 MHz) δ: 0.98 (t, 3H, J=7Hz), 1.21 (t, 2H, J=7Hz), 1.64 (s, 6H), 1.70-1.80 (m, 2H), 2.68 (t, 2H, J=7Hz), 2.91 (t, 2H, J=7Hz), 3.32 (t, 2H, J=7Hz), 4.21 (q, 2H, J=7Hz), 6.82 (d, 2H, J=9Hz), 7.39 (d, 2H, J=8Hz), 7.39 (d, 2H, J=8Hz), 7.91 (d, 2H, J=9Hz).

(3) 2-[4-[3-[2-(4-Chlorophenyl)-5-propyl-4-oxazolyl]propionyl]phenyloxy]-2-methylpropionic acid

White crystalline product

[0097] Yield: 84%

¹H NMR (CDCl₃, 400 MHz) δ: 0.98 (t, 3H, J=7Hz), 1.68 (s, 6H), 1.70-1.80 (m, 2H), 2.70 (t, 2H, J=7Hz), 2.91 (t, 2H, J=7Hz), 3.24 (t, 2H, J=7Hz), 6.89 (d, 2H, J=9Hz), 7.39 (d, 2H, J=8Hz), 7.89 (d, 2H, J=8Hz), 7.89 (d, 2H, J=9Hz).

Example 3] 2-[4-[3-[2-(2-Chlorophenyl)-5-isopropyl-4-oxazolyl](1-hydroxyimino)propyl]phenyloxy]-2-methylpropionic acid

(1) Ethyl 2-[4-[3-[2-(2-chlorophenyl)-5-isopropyl-4-oxazolyl](1-hydroxyimino)propyl]phenyloxy]-2-methylpropionate

[0098] Ethyl 2-[4-[3-[2-(2-chlorophenyl)-5-isopropyl-4-oxazolyl]propionyl]phenyloxy]-2-methylpropionate (60 mg, 0.124 mmol) and hydroxylamine hydrochloride (26 mg, 0.372 mmol) were stirred in a mixture of pyridine (2 mL) and ethanol (3 mL) for 20 hours at room temperature. The reaction mixture was poured into water and extracted with ethyl acetate. The organic layer was collected, washed with water and brine, dried over anhydrous sodium sulfate, and filtered. The ethyl acetate was distilled off under reduced pressure to give the desired compound (45 mg) as colorless oily residue (yield 74%).

¹H NMR (CDCl₃, 400 MHz) δ: 1.20 (t, 3H, J=7Hz), 1.22 (d, 6H, J=7Hz), 1.58 (s, 6H), 2.86 (t, 2H, J=7Hz), 2.95-3.05 (m, 1H), 3.31 (t, 2H, J=7Hz), 4.19 (q, 2H, J=7Hz), 6.78 (d, 2H, J=9Hz), 7.30-7.40 (m, 2H), 7.40-7.50 (m, 1H), 7.53 (d, 2H, J=9Hz), 7.95-8.00 (m, 1H).

(2) 2-[4-[3-[2-(2-Chlorophenyl)-5-isopropyl-4-oxazolyl](1-hydroxyimino)propyl]phenyloxy]-2-methylpropionate

[0099] The above-mentioned oxime derivative (40 mg, 0.08 mmol) was dissolved in a mixture of ethanol (2 mL) and water (1 mL). To the solution was added lithium hydroxide monohydrate (10 mg). The mixture was then stirred for 20 hours at room temperature. The reaction mixture was cooled with ice and neutralized by addition of diluted hydrochloric acid. Then, ethyl acetate was added. The organic layer was collected, washed with water, dried over anhydrous sodium sulfate, and filtered. The ethyl acetate was removed under reduced pressure to give the desired compound (35 mg) as pale yellow oil (yield 92%).

[0100] ¹H NMR (CDCl₃, 400 MHz) δ: 1.22 (d, 6H, J=7Hz), 1.60 (s, 6H), 2.88 (t, 2H, J=7Hz), 2.95-3.05 (m, 1H), 3.14 (t, 2H, J=7Hz), 6.82 (d, 2H, J=9Hz), 7.25-7.40 (m, 2H), 7.41 (d, 2H, J=9Hz), 7.45-7.50 (m, 1H), 7.85-7.90 (m, 1H).

[Example 4] 2-[4-[3-[2-(2-Chlorophenyl)-5-isopropyl-4-oxazolyl]-1-hydroxypropyl]phenyloxy]-2-methylpropionic acid

(1) 4-[3-[2-(2-Chlorophenyl)-5-isopropyl-4-oxazolyl]-1-hydroxypropyl]phenol

[0101] Lithium aluminum hydride (25 mg, 0.659 mmol) was suspended in THF (5 mL). To the suspension was added

4-[3-[2-(2-chlorophenyl)-5-isopropyl-4-oxazolyl]propionyl]phenol (240 mg, 0.65 mmol) for 3 minutes under chilling with ice. The mixture was stirred for one hour under cooling with ice, and further stirred for one hour at room temperature. To this was added saturated aqueous ammonium chloride solution under cooling with ice. The mixture was then filtered over celite. After addition of water and ethyl acetate, the organic layer was collected, washed with water, dried over anhydrous sodium sulfate, and filtered. The ethyl acetate was distilled off under reduced pressure, to give 220 mg of the desired compound as pale yellow oil residue (yield 91%).

¹H NMR (CDCl₃, 400 MHz) δ: 1.30 (d, 3H, J=7Hz), 1.31 (d, 3H, J=7Hz), 2.0-2.1 (m, 2H), 2.6-2.8 (m, 2H), 3.00-3.15 (m, 1H), 3.9-4.0 (br, 1H), 4.77 (t, 1H, J=6Hz), 5.6-5.7 (br, 1H), 6.76 (2H, d, J=8Hz), 7.23 (2H, d, J=8Hz), 7.30-7.40 (m, 2H), 7.45-7.50 (m, 1H), 7.95-8.0 (m, 1H).

(2) 2-[4-[3-[2-(2-Chlorophenyl)-5-isopropyl-4-oxazolyl]-1-hydroxypropyl]phenyloxy]-2-methylpropionic acid

[0102] The above-mentioned phenol compound (110 mg, 0.296 mmol), ethyl 2-bromo-2-methylpropionate (173 mg, 0.887 mmol), and potassium carbonate (122 mg, 0.887 mmol) were suspended in methyl ethyl ketone (3 mL). The suspension was then refluxed for 20 hours. The suspension was allowed to room temperature, filtered to remove insolubles, and washed with methyl ethyl ketone. Subsequently, the solvent was distilled off. The residue was purified by silica gel column chromatography (hexane/ethyl acetate=5/1) to give ethyl 2-[4-[3-[2-(2-chlorophenyl)-5-isopropyl-4-oxazolyl]-1-hydroxypropyl]phenyloxy]-2-methylpropionate (125 mg) as colorless oil (yield 87%).

[0103] The resulting propionic acid derivative (80 mg, 0.16 mmol) was dissolved in a mixture of ethanol (2 mL) and water (1 mL). To the solution was then added lithium hydroxide monohydrate (10 mg). The mixture was stirred for 20 hours at room temperature, cooled with ice, neutralized by addition of diluted hydrochloric acid, and subjected to extraction using ethyl acetate. The organic layer was collected, washed with water and brine, dried over anhydrous sodium sulfate, and filtered. The ethyl acetate was removed under reduced pressure, to give 55 mg of the desired compound as pale yellow oil residue (yield 73%).

¹H NMR (CDCl₃, 400 MHz) δ: 1.29 (d, 3H, J=7Hz), 1.31 (d, 3H, J=7Hz), 1.54 (s, 6H), 2.0-2.2 (m, 2H), 2.69 (t, 2H, J=7Hz), 2.95-3.15 (m, 1H), 4.78 (t, 1H, J=7Hz), 6.86 (d, 2H, J=8Hz), 7.25 (d, 2H, J=8Hz), 7.3-7.4 (m, 2H), 7.45-7.50 (m, 1H), 7.90-7.95 (m, 1H).

[Example 5] 2-[4-[3-[2-(2-Chlorophenyl)-5-isopropyl-4-oxazolyl]-1-propenyl]phenyloxy]-2-methylpropionic acid

(1) 4-[3-[2-(2-Chlorophenyl)-5-isopropyl-4-oxazolyl]propenyl]phenol

[0104] 4-[3-[2-(2-chlorophenyl)-5-isopropyl-4-oxazolyl]-1-hydroxypropyl]phenol (110 mg, 0.296 mmol) and p-toluene-sulfonic acid monohydrate (17 mg, 0.092 mmol) were refluxed in toluene (2 mL) for 20 hours. After the starting compounds diminished, the reaction mixture was poured into water and extracted with ethyl acetate. The organic layer was collected, washed with water, dried over anhydrous sodium sulfate, and filtered. The ethyl acetate was removed under reduced pressure, and the residue was purified by silica gel column chromatography (hexane/ethyl acetate=5/1), to give the desired compound (30 mg) as white crystalline product (yield 28%).

¹H NMR (CDCl₃, 400 MHz) δ: 1.34 (d, 6H, J=7Hz), 3.10-3.20 (m, 1H), 3.45 (d, 2H, J=6Hz), 6.15 (dt, 1H, J=6, 16Hz), 6.34 (d, 1H, J=16Hz), 6.36 (s, 1H), 6.70 (d, 2H, J=8Hz), 7.09 (d, 2H, J=8Hz), 7.3-7.4 (m, 2H), 7.4-7.5 (m, 1H), 7.95-8.00 (m, 1H).

(2) Ethyl 2-[4-[3-[2-(2-chlorophenyl)-5-isopropyl-4-oxazolyl]-1-propenyl]phenyloxy]-2-methylpropionate

[0105] The above-mentioned phenol derivative 30 mg, 0.084 mmol), ethyl 2-bromo-2-methylpropionate (50 mg, 0.254 mmol), and potassium carbonate (35 mg, 0.254 mmol) were suspended in methyl ethyl ketone (3 mL), and the suspension was refluxed for 20 hours. The suspension was allowed to room temperature, filtered to remove insolubles and washed with methyl ethyl ketone. The solvent was distilled off. The residue was purified by silica gel column chromatography (hexane/ethyl acetate=5/1), to give the desired compound (28 mg) as colorless oil (yield 70%).

¹H NMR (CDCl₃, 400 MHz) δ: 1.24 (t, 3H, J=7Hz), 1.32 (d, 6H, J=7Hz), 1.54 (s, 6H), 3.05-3.15 (m, 1H), 3.47 (dd, 2H, J=1, 6Hz), 4.22 (q, 2H, J=7Hz), 6.15 (dt, 1H, J=6, 16Hz), 6.34 (dd, 1H, J=1, 16Hz), 6.77 (d, 2H, J=8Hz), 7.23 (d, 2H, J=8Hz), 7.30-7.40 (m, 2H), 7.45-7.50 (m, 1H); 7.95-8.00 (m, 1H).

(3) 2-[4-[3-[2-(2-Chlorophenyl)-5-isopropyl-4-oxazolyl]-1-propenyl]phenyloxy]-2-methylpropionic acid

[0106] The above-mentioned phenol compound (110 mg, 0.296 mmol), ethyl 2-bromo-2-methylpropionate (173 mg, 0.887 mmol), and potassium carbonate (122 mg, 0.887 mmol) were suspended in methyl ethyl ketone (3 mL). The suspension was then refluxed for 20 hours. The suspension was allowed to room temperature, filtered to remove

insolubles, and washed with methyl ethyl ketone. Subsequently, the solvent was distilled off. The residue was purified by silica gel column chromatography (hexane/ethyl acetate=5/1) to give ethyl 2-[4-[3-[2-(2-chlorophenyl)-5-isopropyl-4-oxazolyl]-1-hydroxypropyl]phenyloxy]-2-methylpropionate (125 mg) as colorless oil (yield 87%).

[0107] The resulting propionic acid derivative (25 mg, 0.053 mmol) was dissolved in a mixture of ethanol (2 mL) and water (1 mL). To the solution was then added lithium hydroxide monohydrate (6 mg). The mixture was stirred for 20 hours at room temperature, and after cooling with ice, cooled with ice, neutralized by addition of diluted hydrochloric acid, and then subjected to extraction using ethyl acetate. The organic layer was collected, washed with water and brine, dried over anhydrous sodium sulfate, and filtered. The ethyl acetate was distilled off under reduced pressure, to give 15 mg of the desired compound as colorless oil residue (yield 63%).

¹H NMR (CDCl₃, 400 MHz) δ: 1.33 (d, 6H, J=7Hz), 1.57 (s, 6H), 3.05-3.20 (m, 1H), 3.48 (dd, 2H, J=1, 6Hz), 6.20-6.30 (m, 1H), 6.42 (dd, 1H, J=1, 16Hz), 6.86 (d, 2H, J=8Hz), 7.22 (d, 2H, J=8Hz), 7.30-7.40 (m, 2H), 7.45-7.50 (m, 1H), 7.95-8.00 (m, 1H).

[Example 6] 2-[4-[3-[2-(2-Chlorophenyl)-5-isopropyl-4-oxazolyl]propyl]phenyloxy]-2-methylpropionic acid

[0108] To a solution of ethyl 2-[4-[3-[2-(2-chlorophenyl)-5-isopropyl-4-oxazolyl]-1-propyl]phenyloxy]-2-methylpropionate (40 mg, 0.085 mmol) in ethanol (8 mL) was added 10%Pt-C (8 mg). The mixture was then stirred for 8 hours under hydrogen atmosphere (atmospheric pressure).

[0109] After the olefinic compound disappeared, water (3 mL) and lithium hydroxide monohydrate (6 mg) were added, and the mixture was stirred for 20 hours. The reaction mixture was cooled with ice and neutralized by addition of hydrochloric acid. To the neutralized mixture was added ethyl acetate. The organic layer was collected, washed with water, dried over anhydrous sodium sulfate, and filtered. The ethyl acetate was removed under reduced pressure, and the residue was purified by silica gel column chromatography (hexane/ethyl acetate=5/1), to give the desired compound (17 mg) as colorless oil (yield after two steps: 45%).

[0110] ¹H NMR (CDCl₃, 400 MHz) δ: 1.29 (d, 6H, J=7Hz), 1.56 (s, 6H), 1.85-2.05 (m, 2H), 2.56 (t, 2H, J=7Hz), 2.65 (t, 2H, J=7Hz), 2.95-3.10 (m, 1H), 6.87 (d, 2H, J=8Hz), 7.11 (d, 2H, J=8Hz), 7.30-7.40 (m, 2H), 7.45-7.50 (m, 1H), 7.90-7.95 (m, 1H).

[Example 7]

[0111] The following compounds were obtained by procedures similar to the procedures described in Example 1.

(7-1) 2-[4-[2-(2-Chlorophenyl)-5-isopropyl-4-oxazolyl]-methylcarbamoyl]phenyloxy-2-methylpropionic acid

White crystalline product of m.p. 120-121°C

[0112] ¹H NMR (CDCl₃, 400 MHz) δ: 1.34 (6H, d, J=7Hz), 1.65 (6H, s), 3.41 (1H, qq, J=7Hz, 7Hz), 4.53 (2H, d, J=6Hz), 6.89 (2H, d, J=9Hz), 7.2-7.4 (2H, m), 7.47 (1H, dd, J=1Hz, 8Hz), 7.67 (1H, dd, J=1Hz, 8Hz), 7.69 (2H, d, J=9Hz), 7.79 (1H, t, J=6Hz).

[0113] IR ν_{max} (KBr) cm⁻¹: 3381, 3377, 2974, 1701, 1691, 1662, 1605, 1574, 1541, 1500, 1460, 1439, 1385, 1288, 1246, 1188, 1155, 1053, 1022, 966, 910, 850, 796, 766, 737, 654, 636, 592.

(7-2) 2-[4-[2-(2-Chlorophenyl)-5-isopropyl-4-oxazolyl]acetylaminol]phenyloxy-2-methylpropionic acid

White amorphous product

[0114] ¹H NMR (CDCl₃, 400 MHz) δ: 1.35 (6H, d, J=7Hz), 1.56 (6H, s), 3.25 (1H, m), 3.67 (2H, s), 6.88 (2H, d, J=9Hz), 7.35-7.40 (2H, m), 7.43 (2H, d, J=9Hz), 7.53 (1H, m), 7.93 (1H, m), 9.39 (1H, s).

(7-3) 2-[4-[4-[2-(2-Chlorophenyl)-5-isopropyl-4-oxazolyl]butyryl]phenyloxy]-2-methylpropionic acid

[0115] Yellow oil

[0116] ¹H NMR (CDCl₃, 400 MHz) δ: 1.30 (d, 6H, J=7Hz), 1.66 (s, 6H), 2.04 (m, 2H), 2.62 (t, 2H, J=7Hz), 2.91 (t, 2H, J=7Hz), 3.10 (m, 1H), 6.91 (d, 2H, J=9Hz), 7.3-7.5 (m, 3H), 7.87 (d, 2H, J=9Hz), 7.91 (m, 1H).

EP 1 310 494 A1

(7-4) 2-[4-[3-[2-(2,4-Dichlorophenyl)-5-isopropyl-4-oxazolyl] propionyl] phenyloxy]-2-methylpropionic acid

White crystalline product of m.p. 100-105°C

[0117] ¹H NMR (CDCl₃, 400 MHz) δ: 1.30 (d, 6H, J=7Hz), 1.65 (s, 6H), 2.95 (t, 2H, J=7Hz), 3.20 (qq, 1H, J=7Hz, J=7Hz), 3.28 (t, 2H, J=7Hz), 6.88 (d, 2H, J=8Hz), 7.29 (dd, 1H, J=2.9Hz), 7.49 (d, 1H, J=2Hz), 7.85 (d, 1H, J=9Hz), 7.85 (d, 2H, J=8Hz).

(7-5) 2-[4-[3-[2-(2,4-Dichlorophenyl)-5-isopropyl-4-oxazolyl]propionyl]phenyloxy]-2-methylbutyric acid

Microcrystalline amorphous product

[0118] ¹H NMR (CDCl₃, 400 MHz) δ: 1.00 (t, 3H, J=7Hz), 1.30 (d, 6H, J=7Hz), 1.57 (s, 3H), 1.90-2.10 (m, 2H), 2.95 (t, 2H, J=7Hz), 3.15-3.40 (m, 3H), 6.90 (d, 2H, J=8Hz), 7.30 (dd, 1H, J=2.9Hz), 7.49 (d, 1H, J=2Hz), 7.88 (d, 1H, J=9Hz), 7.90 (d, 2H, J=8Hz).

(7-6) 2-[4-[3-[2-(2,3-Dichlorophenyl)-5-isopropyl-4-oxazolyl]propionyl]phenyloxy]-2-methylpropionic acid

White amorphous product

[0119] ¹H NMR (CDCl₃, 400 MHz) δ: 1.31 (d, 6H, J=7Hz), 1.69 (s, 6H), 2.93 (t, 2H, J=7Hz), 3.2-3.3 (m, 3H), 6.89 (d, 2H, J=8Hz), 7.49 (d, 1H, J=8Hz), 7.78 (dd, 1H, J=2Hz and 8Hz), 7.81 (d, 2H, J=9Hz), 8.03 (d, 1H, J=2Hz).

[4-[3-[2-(2-Benzofuranyl)-5-isopropyl-4-oxazolyl]propionyl]phenyloxy]-2-methylpropionic acid

White amorphous product

[0120] Brown microcrystalline product of m.p. 135-139°C ¹H NMR (CDCl₃, 400 MHz) δ: 1.33 (d, 6H, J=7Hz), 1.69 (s, 6H), 2.96 (t, 2H, J=7Hz), 3.24 (m, 1H), 3.32 (t, 2H, J=7Hz), 6.91 (d, 2H, J=9Hz), 7.2-7.3 (m, 2H), 7.36 (m, 1H), 7.55 (d, 1H, J=8Hz), 7.62 (d, 1H, J=8Hz), 7.86 (d, 2H, J=9Hz).

IR ν_{max} (KBr) cm⁻¹: 2968, 1713, 1680, 1633, 1599, 1572, 1504, 1470, 1412, 1360, 1302, 1257, 1215, 1149, 1111, 1032, 964, 849, 816, 744.

(7-8) 2-[4-[3-[2-(4-Biphenyl)-5-isopropyl-4-oxazolyl] propionyl]phenyloxy]-2-methylpropionic acid

Pale yellow amorphous product

[0121] ¹H NMR (CDCl₃, 400 MHz) δ: 1.32 (d, 6H, J=7Hz), 1.69 (s, 6H), 2.95 (t, 2H, J=7Hz), 3.1-3.3 (m, 3H), 6.89 (d, 2H, J=9Hz), 7.3-7.7 (m, 7H), 7.77 (d, 2H, J=9Hz), 8.02 (d, 2H, J=8Hz).

(7-9) 2-[4-[3-[2-(1-Hydroxy-2-naphthyl)-5-isopropyl-4-oxazolyl]propionyl]phenyloxy]-2-methylpropionic acid

Pale yellow amorphous product

[0122] ¹H NMR (CDCl₃, 400 MHz) δ: 1.30 (d, 6H, J=7Hz), 1.66 (s, 6H), 2.98 (t, 2H, J=7Hz), 3.22 (qq, 1H, J=7Hz, J=7Hz), 3.36 (t, 2H, J=7Hz), 6.92 (d, 2H, J=8Hz), 7.37 (d, 1H, J=9Hz), 7.4-7.6 (m, 2H), 7.77 (dd, 1H, J=2, 9Hz), 7.81 (d, 1H, J=9Hz), 7.94 (d, 2H, J=8Hz), 8.39 (dd, 1H, J=2, 9Hz).

(7-10) 2-[4-[3-[2-(2,4-Dichlorophenyl)-5-isopropyl-4-oxazolyl]-1-propenyl]phenyloxy]-2-methylpropionic acid

Pale Yellow oil

[0123] ¹H NMR (CDCl₃, 400 MHz) δ: 1.33 (d, 6H, J=7Hz), 1.57 (s, 6H), 3.10 (m, 1H), 3.48 (dd, 2H, J=1, 6Hz), 6.25 (m, 1H), 6.42 (dd, 1H, J=1, 16Hz), 6.86 (d, 2H, J=8Hz), 7.25-7.35 (m, 2H), 7.50 (d, 1H, J=2Hz), 7.92 (d, 2H, J=8Hz).

(7-11) 2-[4-[3-[2-(3-Hydroxy-2-naphthyl)-5-isopropyl-4-oxazolyl]propionyl]phenyloxy]-2-methylpropionic acid

Yellow amorphous product

5 [0124] ¹H NMR (CDCl₃, 400 MHz) δ: 1.37 (d, 6H, J=7Hz), 1.66 (s, 6H), 2.97 (t, 2H, J=7Hz), 3.25 (m, 1H), 3.35 (t, 2H, J=7Hz), 6.92 (d, 2H, J=9Hz), 7.30 (m, 1H), 7.35 (s, 1H), 7.43 (m, 1H), 7.68 (d, 1H, J=7Hz), 7.81 (d, 1H, J=7Hz), 7.93 (d, 2H, J=9Hz), 8.30 (s, 1H).

(7-12) 2-[4-[3-[2-(3-Chloro-2-hydroxyphenyl)-5-isopropyl-4-oxazolyl]propionyl]phenyloxy]-2-methylpropionic acid

10

White amorphous product

15 [0125] ¹H NMR (CDCl₃, 400 MHz) δ: 1.31 (d, 6H, J=7Hz), 1.67 (s, 6H), 2.94 (t, 2H, J=7Hz), 3.20 (m, 1H), 3.31 (t, 2H, J=7Hz), 6.90 (dd, 1H, J=2 and 9Hz), 6.93 (d, 2H, J=9Hz), 7.03 (d, 1H, J=2Hz), 7.68 (d, 1H, J=9Hz), 7.91 (d, 2H, J=9Hz).

(7-13) 2-[4-[3-[2-(4-Bromo-2-chlorophenyl)-5-isopropyl-4-oxazolyl]propionyl]phenyloxy]-2-methylpropionic acid

White amorphous product

20

[0126] ¹H NMR (CDCl₃, 400 MHz) δ: 1.30 (d, 6H, J=7Hz), 1.65 (s, 6H), 2.94 (t, 2H, J=7Hz), 3.20 (m, 1H), 3.26 (t, 2H, J=7Hz), 6.87 (d, 1H, J=9Hz), 7.43 (dd, 1H, J=2, 8Hz), 7.65 (d, 1H, J=2Hz), 7.76 (d, 1H, J=8Hz), 7.83 (d, 2H, J=9Hz).

(7-14) 2-[4-[3-[2-(3-Chloro-4-biphenyl)-5-isopropyl-4-oxazolyl]propionyl]phenyloxy]-2-methylpropionic acid

25

White amorphous product

30 [0127] ¹H NMR (CDCl₃, 400 MHz) δ: 1.32 (d, 6H, J=7Hz), 1.65 (s, 6H), 2.97 (t, 2H, J=7Hz), 3.22 (m, 1H), 3.27 (t, 2H, J=7Hz), 6.88 (d, 2H, J=9Hz), 7.3-7.5 (m, 3H), 7.53 (dd, 1H, J=2, 8Hz), 7.5-7.6 (m, 2H), 7.71 (d, 1H, J=2Hz), 7.82 (d, 1H, J=9Hz); 7.95 (d, 2H, J=8Hz).

[Example 8]

[0128] The following compound was obtained by procedures similar to the procedures described in Example 1.

35

(8-1) 2-[4-[3-[2-[(4-Trifluoromethyl)phenyl]-4-methyl-5-thiazolyl]propionyl]phenyloxy]-2-methylpropionic acid

White crystalline product of m.p. 158-160°C

40 [0129] ¹H NMR (CDCl₃, 400 MHz) δ: 1.68 (s, 6H), 2.45 (s, 3H), 3.2-3.35 (m, 4H), 6.93 (d, 2H, J=9Hz), 7.63 (d, 2H, J=9Hz), 7.91 (d, 2H, J=9Hz), 7.96 (d, 2H, J=9Hz).

(8-2) The following compound was obtained by procedures similar to the procedures described in Example 1.

45

2-[3-[3-[2-(2,4-Dichlorophenyl)-5-isopropyl-4-oxazolyl]propionyl]phenyloxy]-2-methylpropionic acid

White crystalline product of m.p. 115-120°C

50 [0130] ¹H NMR (CDCl₃, 400 MHz) δ: 1.31 (d, 6H, J=7Hz), 1.62 (s, 6H), 2.92 (t, 2H, J=7Hz), 3.16 (qq, 1H, J=7Hz, J=7Hz), 3.24 (t, 2H, J=7Hz), 7.16 (dd, 1H, J=2, 9Hz), 7.34 (dd, 1H, J=2, 9Hz), 7.35 (t, 1H, J=9Hz), 7.51 (d, 1H, J=2Hz), 7.6-7.7 (m, 2H), 7.88 (d, 1H, J=9Hz).

(8-3) 3-[2-(2,4-Dichlorophenyl)-5-isopropyl-4-oxazolyl]-1-(4-hydroxyphenyl)propan-1-one,

55

[0131] To ice-cooled THF (15 mL) was added 60% sodium hydride (120 mg, 3.00 mmol). To the mixture was dropwise added for 30 minutes a solution of ethyl 2-[(4-benzyloxy)benzoyl]acetate (900 mg, 3.02 mmol) in THF (15 mL). The resulting mixture was allowed to room temperature. The mixture was then stirred for 30 minutes, and to this was added 4-iodomethyl-5-isopropyl-2-(2,4-dichlorophenyl)oxazole (1.20 g, 3.00 mmol). The mixture was refluxed for 20 hours

and nitrogen atmosphere, and then allowed to room temperature. THF was removed under reduced pressure. To the residue was added a mixture of acetic acid (7.5 mL) and conc. hydrochloric acid (2.0 mL). The resulting mixture was refluxed for 5 hours, allowed to room temperature, and poured into ice-cooled water. Ethyl acetate was added, and the organic layer was collected, washed with saturated aqueous sodium hydrogen carbonate, water and brine, dried over anhydrous sodium sulfate, and filtered. The ethyl acetate was removed under reduced pressure. The residue was purified by silica gel column chromatography (hexane/ ethyl acetate=3/1), to give the desired compound (650 mg) as pale yellowish white crystalline product (yield 53%).

¹H NMR (CDCl₃, 400 MHz) δ: 1.32 (d, 6H, J=7Hz), 2.96 (t, 2H, J=7Hz), 3.22 (qq, 1H, J=7Hz, 7Hz), 3.25 (t, 2H, J=7Hz), 6.77 (d, 2H, J=8Hz), 7.29 (dd, 1H, J=2, 8Hz), 7.49 (t, 1H, J=8Hz), 7.60 (brs, 1H), 7.76 (d, 2H, J=8Hz), 7.84 (d, 1H, J=8Hz).

(2) 3-[2-(2,4-Dichlorophenyl)-5-isopropyl-4-oxazoly]-1-[(4-dimethylthiocarbamoyloxy)phenyl]propan-1-one

[0132] In dry dioxane (5.0 mL) were dissolved the above-mentioned phenol derivative (1.00 g, 2.47 mmol), 4-dimethylaminopyridine (30 mg, 0.25 mmol) and triethylamine (0.7 mL). To the solution was added under icecooling dimethylcarbonyl chloride (367 mg, 2.97 mmol). The mixture was heated, refluxed overnight, allowed to room temperature, and poured into ice-cooled water. Ethyl acetate was added, and the organic layer was collected. The organic layer was washed with saturated aqueous sodium hydrogen carbonate solution, water and brine, dried over anhydrous sodium sulfate, and filtered. The ethyl acetate was removed under reduced pressure. The residue was purified by silica gel column chromatography (hexane/ethyl acetate= 3/1), to give the desired compound (1.15 g) as pale yellow oil (yield 95%).

¹H NMR (CDCl₃, 400 MHz) δ: 1.31 (d, 6H, J=7Hz), 2.98 (t, 2H, J=7Hz), 3.20 (qq, 1H, J=7Hz, 7Hz), 3.36 (s, 3H), 3.39 (t, 2H, J=7Hz), 3.46 (s, 3H), 7.15 (d, 2H, J=8Hz), 7.30 (dd, 1H, J=2, 9Hz), 7.49 (d, 1H, J=2Hz), 7.89 (d, 1H, J=9Hz), 8.04 (d, 2H, J=8Hz).

(3) 3-[2-(2,4-Dichlorophenyl)-5-isopropyl-4-oxazoly]-1-[(4-dimethylthiocarbamoylsulfanyl)phenyl]propan-1-one

[0133] In n-tetradecane (15 mL) was dissolved the above-mentioned thiocarbonyl compound (1.10 g, 2.24 mmol). The mixture was refluxed for at 250°C (inside temperature) for 8 hours, and then allowed to room temperature. Subsequently, the reaction mixture was directly subjected to purification by silica gel column chromatography (hexane/ethyl acetate=3/1), to give the desired compound (350 mg) as pale yellow oil (yield 31%).

¹H NMR (CDCl₃, 400 MHz) δ: 1.31 (d, 6H, J=7Hz), 2.98 (t, 2H, J=7Hz), 3.0-3.2 (br, 6H), 3.19 (qq, 1H, J=7Hz, 7Hz), 3.39 (t, 2H, J=7Hz), 3.39 (t, 2H, J=7Hz), 7.30 (dd, 1H, J=2, 9Hz), 7.49 (d, 1H, J=2Hz), 7.58 (d, 2H, J=8Hz), 7.88 (d, 1H, J=9Hz), 7.98 (d, 2H, J=8Hz).

(4) 3-[2-(2,4-Dichlorophenyl)-5-isopropyl-4-oxazoly]-1-(4-mercaptophenyl)propan-1-one

[0134] In dry methanol (8 mL) was dissolved the above-mentioned carbonyl compound (335 mg, 0.68 mmol). To the solution was added 0.5N MeONa (2.0 mL). The mixture was refluxed for 20 hours and then allowed to room temperature. The reaction mixture was poured into ice-cooled water and neutralized by addition of 3N aqueous hydrochloric acid. Ethyl acetate was added, and the organic layer was collected, washed with water and brine, dried over anhydrous sodium sulfate, and filtered. The ethyl acetate was distilled off under reduced pressure, to give the desired compound (277 mg) as pale yellowish white crude solid (yield: 97%, as crude product).

¹H NMR (CDCl₃, 400 MHz) δ: 1.30 (d, 6H, J=7Hz), 2.96 (t, 2H, J=7Hz), 3.16 (qq, 1H, J=7Hz, 7Hz), 3.24 (t, 2H, J=7Hz), 3.60 (s, 1H), 7.2-7.3 (m, 3H), 7.49 (d, 1H, J=2Hz), 7.84 (d, 2H, J=8Hz), 7.87 (d, 1H, J=9Hz).

(5) 2-[4-[3-[2-(2,4-Dichlorophenyl)-5-isopropyl-4-oxazoly]propionyl]phenylsulfanyl]-2-methylpropionic acid

[0135] The desired compound was obtained using 3-[2-(2,4-dichlorophenyl)-5-isopropyl-4-oxazoly]-1-(4-mercaptophenyl)propan-1-one obtained in (4) above by procedures similar to the procedures of (2) and (3) of Example 1.

Pale yellow amorphous product

[0136] ¹H NMR (CDCl₃, 400 MHz) δ: 1.30 (d, 6H, J=7Hz), 1.52 (s, 6H), 2.97 (t, 2H, J=7Hz), 3.19 (qq, 1H, J=7Hz, 7Hz), 3.37 (t, 2H, J=7Hz), 7.29 (dd, 1H, J=2, 8Hz), 7.48 (d, 1H, J=2Hz), 7.55 (d, 2H, J=9Hz), 7.86 (d, 2H, J=8Hz), 7.90 (d, 2H, J=9Hz).

(8-4) The following compound was obtained by procedures similar to the procedures described in Example 1.

2- [4- [3- [2- [(4-Trifluoromethyl)phenyl]-4-isopropyl-5-thiazolyl]propionyl]phenoxy]-2-methylpropionic acid

White amorphous product

[0137] ¹H NMR (CDCl₃, 400 MHz) δ: 1.33 (d, 6H, J=7Hz), 1.68 (s, 6H), 3.15 (qq, 1H, J=7Hz, 7Hz), 3.2-3.3 (m, 4H), 6.94 (d, 2H, J=9Hz), 7.64 (d, 1H, J=8Hz), 7.92 (d, 2H, J=9Hz), 7.99 (d, 2H, J=8Hz).

[Example 9]

(Pharmacological tests)

I. Method of measurement

(1) Measurement of PPARα,γ,δ transactivation activity

[0138] PPARα,γ,δ transactivation activity of each compound [Examples 1-6 and known PPARδ agonist (L-16504: Berger, J., et al. (1999); J. Biol. Chem., 274:6718-6725)] was measured in the manner described below.

1) Material

[0139] CV-1 was obtained from Tohoku University Aging Medical Laboratory, Medical Cell Collection Center. All test compounds were dissolved in dimethylsulfoxide (DMSO) to give a test sample of 0.1% concentration.

2) Plasmid

[0140] Receptor expression plasmid (GAL4-hPPARα, LBD GAL4-hPPARγLBD, GAL4-hPPARδ LBD), Reporter plasmid (UASx4-TK-LUC), and β-galactosidase expression plasmid (βGAL) similar to Kliewer, S.A., et al., ((1992) Nature, 358:771 774) were employed.

3) Transfection

[0141] CV-1 cells were seeded in 24 well culture plates at 2x10⁵ cells per well, and cultured for 24 hours using 4%-fetal bovine serum(FBS)-added OPTI-MEM I Reduced Serum Medium (Life Technologies, 500 μL/well). Subsequently, the cells were washed with non serum-added OPTI-MEM. To the washed cells were added DNA-containing solution [the following components were contained in the one well solution (250 μl): 0.03 μg of GAL4-hPPARδ LBD, 0.25 μg of UASx4-TK-LUC, 0.35 μg of βGAL, and 2 μL of lipofection reagent, DMRIE-C (Life Technologies). These components were dissolved in OPTI-MEM and allowed to stand for 30 minutes at room temperature]. The cells were incubated for 5 hours at 37°C.

4) Cell treatment by addition of test compound

[0142] The cells were then incubated for 40 hours in 500 μL of fresh OPTI-MEM containing 4% FBS and the test compound (dissolved in 100% DMSO to reach a final concentration: 10⁻⁴M or 10⁻⁵M).

5) Measurement of reporter gene expression level

[0143] The culture medium was removed and the cells were washed with PBS twice. Cell lysates were produced using a solubilizing buffer (25 mM Tris-PO₄ (pH 7.8), 15%v/v glycerol, 2% CHAPS, 1% Lecithin, 1% BSA, 4 mM EGTA (pH 8.0), 8 mM MgCl₂, 1 mM DTT). A portion (20 μL) of the solution was transferred onto a 96-well plate. Subsequently, 100 μL of luciferase substrate solution (Piccagene: available from Nippon Gene Co., Ltd.) was added, and a luminous intensity per one sec. (luciferase activity) was measured by means of MLR-100 type Microluminoreader (available from Corona Electrics Co., Ltd.). Further, the activity caused by βGAL incorporation which was incorporated into the cells simultaneously with the incorporation of the luciferase gene was measured, for correcting variation of luciferase activity by the addition of the compound, utilizing the transfection efficiency of the incorporated gene. β-Galactosidase activity was measured by the following method: 50 μL of the solubilized sample was placed on another 96-well plate; 10 μL of ONPG (2-nitrophenyl-β-galactopyranoside) solution was added; incubation was carried out for 5 minutes at room

temperature; 50 μ L of a reaction stopping solution (1M sodium carbonate solution) was added; and the absorbance at 414 nm was measured. A relative PPAR activity was calculated based on the following: 0% (luciferase activity (control value) of cells treated with DMSO (0.1% concentration, solvent) alone), 100% (luciferase activity of cells treated with a control reagent (PPAR α : 10^{-4} M WY-165041, PPAR γ : 10^{-5} M Rosiglitazone, PPAR δ : 10^{-4} M L-165041)).

II. Results

[0144] The results of test are shown in Table 25.

Table 25

	PPAR α	PPAR γ	PPAR δ
Example 1	9 \pm 1	27 \pm 3	80 \pm 10
Example 2	75 \pm 4	51 \pm 3	93 \pm 4
Example 3	10	16	19
Example 4	35	26	23
Example 5	52 \pm 7	36 \pm 3	114 \pm 1
Example 6	98 \pm 6	93 \pm 1	109 \pm 10
L-165041	2 \pm 1	1 \pm 0	32 \pm 15
PPAR transactivation activity: a relative value (control=100%) PPAR α , γ , δ transactivation activity of each compound at 10^{-5} M is shown.			

[0145] As is apparent from Table 25, the compounds of Examples have PPAR δ transactivation activity similar to or higher than that of L-165041.

[Example 10]

[0146] The compounds of Example 7 were measured with respect to the PPAR activating power in the manner as described in Example 9. The results are set forth in Table 26.

Table 26

	PPAR α	PPAR γ	PPAR δ
Example 7-4	1	2	86 \pm 10
Example 7-5	1	2	58 \pm 14
Example 7-6	8	19	96 \pm 13
Example 7-7	1	9	65 \pm 2
Example 7-8	1	26	58
Example 7-9	8	5 \pm 1	80 \pm 5
Example 7-10	3	1	70
Example 7-11	29 \pm 3	18 \pm 4	85 \pm 1
Example 7-12	8 \pm 1	4	79 \pm 2
Example 7-13	1	3	81
Example 7-14	2	18	53
L-165041	2 \pm 1	1 \pm 0.03	32 \pm 15

[0147] As is apparent from Table 26, the compounds of the invention of Examples (Example 7-4, Example 7-6, Example 7-11, etc.) have PPAR δ transactivation activity similar to or higher than that of L-165041. Further, it has been confirmed that the compounds of the invention (Example 7-4, Example 7-12, etc.) show higher PPAR δ transactivation activity than PPAR α -activating power and PPAR γ transactivation activity power.

[Example 11]

[0148] The compounds of Example 8 were measured with respect to the PPAR transactivation activity in the manner as described in Example 9. The results are set forth in Table 27.

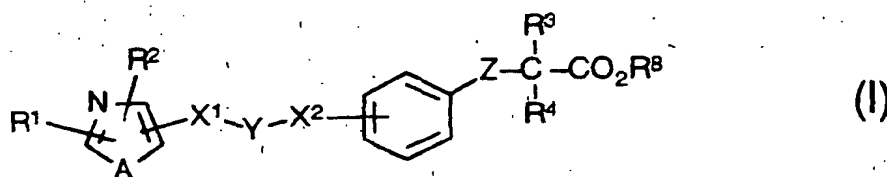
Table 27

	PPAR α	PPAR γ	PPAR δ
Example 8-1	129	5	89
Example 8-1	126	62	53
Example 8-1	120	31	97
Example 8-1	166	86	132
PPAR transactivation activity: a relative value at 10 ⁻⁵ M (control=100%) PPAR α : WY-14643 (10 ⁻⁴ M) PPAR γ : Rosiglitazone (10 ⁻⁵ M) PPAR δ : L-165041 (10 ⁻⁴ M)			

[0149] As is apparent from Table 27, the compounds of the invention (Example 8-1 to Example 8-4) have PPAR δ transactivation activity similar to or higher than that of L-165041.

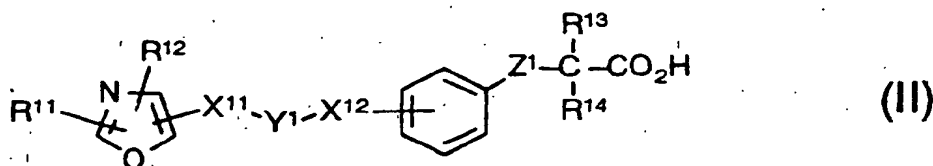
Claims

1. A compound having the following general formula (I) or a salt thereof:



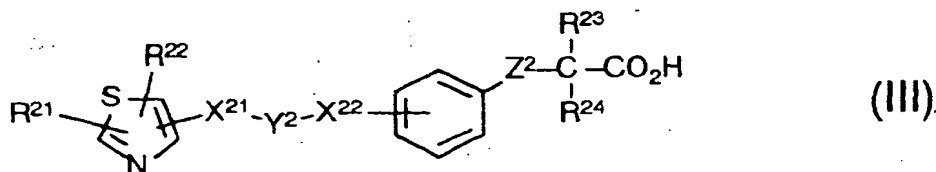
wherein each of R¹ and R² independently is a hydrogen atom, an alkyl group having 1-8 carbon atoms, an alkyl group having 1-8 carbon atoms and a halogen atom substituent, an alkenyl group having 2-8 carbon atoms, an alkynyl group having 2-8 carbon atoms, a 3-7 membered cycloalkyl group, an alkyl group having 1-8 carbon atom and a 3-7 membered substituent, an arylalkyl group that has a C₆₋₁₀ aryl portion and C₁₋₄ alkyl portion and optionally has a substituent, or an aryl or heterocyclic group which optionally has a substituent; A is O, S, or NR⁵ in which R⁵ is H or C₁₋₈ alkyl; each of X¹ and X² independently is a bond, O, S(O)_p in which p is an integer of 0 to 2, C(=O), C(=N-OR⁶) in which R⁶ is H or C₁₋₈ alkyl; C(=O)NH, NHC(=O), SO₂NH, NHSO₂, CH(OR⁷) in which R⁷ is H or C₁₋₈ alkyl, CH=CH, or C≡C; Y is an alkylene chain having 1-8 carbon atoms and optionally a substituent; Z is O or S; each of R³ and R⁴ independently is an alkyl group having 1-8 carbon atoms and optionally a substituent; and R⁸ is a hydrogen atom or an alkyl group having 1-8 carbon atoms; provided that X² is neither O nor S(O)_p when X¹ is a bond, while X² is not a bond when X¹ is C(=O)NH.

2. An oxazole derivative having the following formula (II) or a salt thereof:



wherein each of R¹¹ and R¹² independently is an alkyl group having 1-8 carbon atoms, an alkyl group having 1-8 carbon atoms and 1-3 halogen atom substituents, an alkenyl group having 2-8 carbon atoms, an alkynyl group having 2-8 carbon atoms, a 3-7 membered cycloalkyl group, an alkyl group having 1-8 carbon atom and a 3-7 membered substituent, or a phenylalkyl group having C₁₋₄ alkyl portion, phenyl group, naphthyl group, pyridyl group, thienyl group, furyl group, quinolyl group, benzofuranyl group or benzothienyl group which optionally contains a substituent of halogen, hydroxyl, nitro, amino, C₁₋₈ alkyl, C₁₋₈ alkyl having 1-3 halogen substituents, C₁₋₈ alkoxy, C₁₋₈ alkoxy having 1-3 halogen substituents, phenyl, benzyl, phenyloxy, benzoyl or pyridyl; each of X¹¹ and X¹² independently is a bond, S(O)_q in which q is an integer of 0 to 2, C(=O), C(=N-OR¹⁶) in which R¹⁶ is H or C₁₋₈ alkyl; C(=O)NH, NHC(=O), SO₂NH, NHSO₂, CH(OR¹⁷) in which R¹⁷ is H or C₁₋₈ alkyl, CH=CH, or C=C; Y¹ is an alkylene chain having 1-8 carbon atoms and optionally a C₁₋₈ alkyl or C₁₋₈ alkoxy substituent; Z¹ is O or S; each of R¹³ and R¹⁴ independently is an alkyl group having 1-8 carbon atoms and optionally a halogen or C₁₋₈ alkoxy substituent; provided that X¹² is neither O nor S(O)_q when X¹¹ is a bond, while X¹² is not a bond when X¹¹ is C(=O)NH.

3. The oxazole derivative or the salt of claim 2, wherein X¹¹ is a bond.
4. The oxazole derivative or the salt of claim 2 or 3, wherein X¹² is a bond, C(=O), C(=N-OH), C(=O)NH, NHC(=O), CH(OH) or CH=CH.
5. The oxazole derivative or the salt of any one of claims 2 to 4, wherein R¹¹ is a phenyl group, naphthyl group, pyridyl group, thienyl group, furyl group, quinolyl group, benzofuranyl group or benzothienyl group which optionally contains a substituent of halogen, hydroxyl, nitro, amino, C₁₋₈ alkyl, C₁₋₈ alkyl having 1-3 halogen substituents, C₁₋₈ alkoxy, C₁₋₈ alkoxy having 1-3 halogen substituents, phenyl, benzyl, phenyloxy, benzoyl or pyridyl.
6. The oxazole derivative or the salt of any one of claims 2 to 5, wherein R¹² is an alkyl group having 1-8 carbon atoms, or an alkyl group having 1-8 carbon atoms and 1-3 halogen atom substituents.
7. The oxazole derivative or the salt of any one of claims 2 to 6, wherein R¹² is attached to the 2-position of the oxazole ring.
8. A thiazole derivative having the following formula (III) or a salt thereof:



wherein each of R²¹ and R²² independently is an alkyl group having 1-8 carbon atoms, an alkyl group having 1-8 carbon atoms and 1-3 halogen atom substituents, an alkenyl group having 2-8 carbon atoms, an alkynyl group having 2-8 carbon atoms, a 3-7 membered cycloalkyl group, an alkyl group having 1-8 carbon atom and a 3-7 membered substituent, or a phenylalkyl group having C₁₋₄ alkyl portion, phenyl group, naphthyl group, pyridyl group, thienyl group, furyl group, quinolyl group, benzofuranyl group or benzothienyl group which optionally contains a substituent of halogen, hydroxyl, nitro, amino, C₁₋₈ alkyl, C₁₋₈ alkyl having 1-3 halogen substituents, C₁₋₈ alkoxy, C₁₋₈ alkoxy having 1-3 halogen substituents, phenyl, benzyl, phenyloxy, benzoyl or pyridyl; each of X²¹ and X²² independently is a bond, S(O)_r in which r is an integer of 0 to 2, C(=O), C(=N-OR²⁶) in which R²⁶ is H or C₁₋₈ alkyl; C(=O)NH, NHC(=O), SO₂NH, NHSO₂, CH(OR²⁷) in which R²⁷ is H or C₁₋₈ alkyl, CH=CH, or C=C; Y² is an alkylene chain having 1-8 carbon atoms and optionally a C₁₋₈ alkyl or C₁₋₈ alkoxy substituent; Z² is O or S; each of R²³ and R²⁴ independently is an alkyl group having 1-8 carbon atoms and optionally a halogen or C₁₋₈ alkoxy substituent; provided that X²² is neither O nor S(O)_r when X²¹ is a bond, while X²² is not a bond when X²¹ is C(=O)NH.

9. The thiazole derivative or the salt of claim 8, wherein X²¹ is a bond.
10. The thiazole derivative or the salt of claim 8 or 9, wherein X²² is a bond, C(=O), C(=N-OH), C(=O)NH, NHC(=O), CH(OH) or CH=CH.

11. The thiazole derivative or the salt of any one of claims 8 to 10, wherein R²¹ is a phenyl group, naphthyl group, pyridyl group, thienyl group, furyl group, quinolyl group, benzofuranyl group or benzothienyl group which optionally contains a substituent of halogen, hydroxyl, nitro, amino, C₁₋₈ alkyl, C₁₋₈ alkyl having 1-3 halogen substituents, C₁₋₈ alkoxy, C₁₋₈ alkoxy having 1-3 halogen substituents, phenyl, benzyl, phenyloxy, benzoyl or pyridyl.
12. The thiazole derivative or the salt of any one of claims 8 to 11, wherein R²² is an alkyl group having 1-8 carbon atoms, or an alkyl group having 1-8 carbon atoms and 1-3 halogen atom substituents.
13. The thiazole derivative or the salt of any one of claims 8 to 12, wherein R²² is attached to the 2-position of the thiazole ring.
14. An activator of peroxisome proliferator activated receptor δ which contains as an effective component a compound or a salt thereof defined in any one of claims 1 to 13.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP01/06836

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl. ⁷ C07D263/32, 277/24, 413/04, 263/48, 263/34, 277/28, 417/04, 233/64, 233/70, 233/88, 233/90, A61K31/421, 31/4439, 31/426, 31/4164, 31/4709, 31/505, 31/422, 31/427 // A61P43/00, 3/10, 3/06, 3/04, 9/10, 9/00, 35/00, 25/28, 29/00, 19/10, 5/38 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) Int.Cl. ⁷ C07D263/32, 277/24, 413/04, 263/48, 263/34, 277/28, 417/04, 233/64, 233/70, 233/88, 233/90, A61K31/421, 31/4439, 31/426, 31/4164, 31/4709, 31/505, 31/422, 31/427 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) REGISTRY (STN)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 92/10468 A (The Wellcome Foundation, Limited), 25 June, 1992 (25.06.92), & US 5658944 A & JP 6-507151 A & EP 639178 A	1-14
A	WO 97/28115 A (Merck & Co., Inc.), 07 August, 1997 (07.08.97), & EP 888278 A	1-14
A	EP 558062 A (Ono Pharmaceutical Co., Ltd.), 01 September, 1993 (01.09.93), & US 5378716 A & US 5536736 A & US 5703099 A & US 5935985 A & JP 6-056744 A & JP 12-86635 A	1-14
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "1" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 04 October, 2001 (04.10.01)		Date of mailing of the international search report 16 October, 2001 (16.10.01)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.